# FORESTRY LEAVES

*Official Publication of the Alumni and Student Body*
*U.P. College of Forestry, College, Laguna*

## IN THIS ISSUE



MOVING-UP DAY ISSUE Vol. XV No. 1

# TRUE COURAGE

TRUE courage smiles. It cannot express itself otherwise. Courage is the prime virtue, the necessary element of existence, the birth of everything. Because it is in itself all positive, it cannot be divorced from love and creation, it is in itself happy —the only happiness—and a smile is the only form it can take on the human face.

The archaic smile of the ancient gods and heroes identified them. In less mythological times, such as ours, the same smile returns on the humble features of millions of unknown men and women, when they find in themselves the basic form of courage: the courage of living.

We have all met many great heroes, men who consciously lived and died for freedom. But the infinite mass of obscure men who daily accept reality with a smile manifest a silent courage that makes life worthy of being lived.

—CARLO LEVI, physician, painter and writer, author of the best-selling novel "Christ Stopped at Eboli."

## Office of the President
### of the Philippines

**M E S S A G E**

It is with pleasure that I convey my greetings to the members of the 1964 class of the College of Forestry of the University of the Philippines on the occasion of their closing exercises.

This is perhaps the most opportune moment for the graduates to take stock of what they have learned and to determine how to apply their knowledge in promoting the best interests of their community and country. It has often been said that graduation is not an end in itself, but a means to an end. Graduation is but a stepping-stone to more important objectives of life. Graduates who realize the importance of this fact will fully understand the true value of their education.

When the graduates leave their alma mater, they will not be entering a world of comfort and contentment. Rather, they will be facing the hard realities of life and the challenges of their profession. Our forests are part of our nation's heritage and the task of conserving this treasure of nature for our own benefit and for those to come after us falls squarely on the shoulders of the graduates. I therefore urge them to use their training and knowledge in meeting these difficulties and in carving out their road to success.

On this significant occasion, I convey my every wish for the graduates' health, happiness and success in the future.

PRESIDENT OF THE PHILIPPINES

REPUBLIC OF THE PHILIPPINES

# SENATE

MANILA

## MESSAGE

I am happy to greet the members of the graduating class, College of Forestry, University of the Philippines, on the occasion of their Moving-Up Day.

For the past four years, you have imbibed from the intellectual largesse of your professors in order that you may strengthen and enrich your knowledge and prepare for the day when you may rise up as outstanding men and women. Now, you are equipped with the resources of mind, the strength of body, and the firmness of character, as U.P. graduates, to seek your future with confidence in your chosen field of endeavors.

I hope that you as Foresters will remember that the national forests are resources to be kept and preserved for the coming generations, and that a tree, not only provides men his shelters, but also inspiration as a thing of beauty.

FERDINAND E. MARCOS
Senate President

UNIVERSITY OF THE PHILIPPINES
QUEZON CITY

OFFICE OF THE PRESIDENT

## MESSAGE

Moving-Up Day is one of the unique occasions when the College of Forestry students and professors, in a fraternal get-together, usher into the world of day one more group of Bachelor of Science degree-holders. Awaiting this group of graduates is, of course, the harsh sunlight, the stark shadows, dirt roads, rain, and even storms of reality. But off this batch must go — to meet the challenges that years of study have prepared them to meet. To the confidence which individually every graduate exhibits, the College adds its own. And certainly the University, too, shares that confidence.

To this group, then, my congratulations on this year's celebration of Moving-Up Day; and to Forestry Leaves, who has kept the tradition of celebrating this occasion, my personal warm greetings.

February 20, 1964

Republic of the Philippines
Department of Agriculture and Natural Resources
Office of the Secretary
Diliman, Quezon City

# MESSAGE

Through the columns of the Forestry Leaves, I wish to extend my warm greetings and congratulations to the graduating students of the U.P. College of Forestry on the occasion of their coming Move-Up Day on which senior students successfully completing the Ranger course will be receiving their diplomas, while those graduating with the degree of Bachelor of Science are to be honored. The Forestry Leaves itself, being the official publication of the Student Body and Alumni of the Forestry College, is honoring these graduating students by putting out this special number.

By reason of the acute lack of foresters in the Philippines and in view of the forestry protection and conservation problems confronting the country today, great opportunities for service are open to these forestry graduates. Whether as mentors in forestry educational institutions, or as employees of the government in the Bureau of Forestry, or as employees and/or operators of commercial forestry projects, their specialized training and know-how in forestry will go a long way in helping solve our current problems in this particular field of science. And, of course, it goes without saying that they would also make their contribution in promoting the use of mass communication techniques for the wise use of our forested areas, not only to make available all the forest products needed by our expanding population at a given time, but also to see to it that a continuous supply of these is insured, without detriment to the soils and water resources of the land.

May the forthcoming Moving-Up Day inspire the graduates to take advantage of the foregoing service opportunities for them to help build up the nation.

JOSE Y. FELICIANO
Secretary of Agriculture and
Natural Resources

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
REFORESTATION ADMINISTRATION
DILIMAN, QUEZON CITY

*In reply, address:*
P. O. Box 2363, Manila

Tel. No. 7-80-47 Local 21

# MESSAGE

What does it take to be a forestry graduate? Intelligence, mettle, and a green thumb. It is true that every other graduate concentrates on becoming a better citizen, but to the ranger and forester alone goes the distinctive label of becoming the able "keepers" of our rich, virgin patrimony -- the forests.

It is this high esteem and admiration I have long held for the graduates in the U. P. College of Forestry that compels me to extend the Class of 1964 my greetings and congratulations on their Moving-Up Day, via the Forestry Leaves.

Indeed, trees are things of beauty, grace and vitality as well as utility. These young graduates could as well be the breathing symbols of the gracefulness, vitality, and usefulness of the present Filipino youth.

I have resisted the oft-repeated phrases demanded by occasions like these, but as a proponent of conservation myself, I sincerely believe that another harvest of a successful crop of forestry graduates this year demonstrates that conservation is very much vigorously alive in this country.

Congratulations on this milestone !

JOSE VIADO
Administrator

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
PARKS AND WILDLIFE OFFICE
MANILA

## M E S S A G E

It is a pleasure to greet the forestry students on the occasion of their graduation in their chosen course, the most painstaking, but one of the noblest fields of study. I congratulate them for rightly selecting forestry as a career. The study of forestry is tedious and the job ahead is hazardous, but the reward is far more glorious than all the laurels that could be bestowed upon other pursuits of life. The study of forestry is shunned mostly by those who aim at white-collar jobs but the forestry students who are graduating now, have shown their determination to attain the acme of their ambitions through the hard way - a stoic decision.

All the years of their studies to acquire knowledge in husbanding our forest resources, they voluntarily forego momentary happiness which are found in the city. They isolated themselves in the wilderness of Mt. Makiling and dedicated their efforts to learn all about trees and forest, so that when the time comes, they will be ready to practice their profession creditably. Our country needs more foresters and their field is unlimited.

As civilization advances, forestry problems multiply and become complicated. We need more technically trained men to solve these problems and the rangers and foresters trained in the College of Forestry, University of the Philippines are the best materials.

VICENTE DE LA CRUZ
Director

University of the Philippines
COLLEGE OF FORESTRY
COLLEGE, LAGUNA

## MESSAGE

Conservation of our forest resources is the concern of all our people. But it is the particular concern of foresters. For Forestry is one field which needs not only special efforts but also specialized knowledge. This is particularly urgent now when the dimensions of the kaingin problem and indiscriminate logging have been compounded by the tremendous pressures of population explosion, unemployment, and politics.

I know that our foresters are facing the most fearful challenge from all sectors of the country. They are expected to overcome forestry problems which are a result of man's relation to man in the use of natural resources.

But it is perhaps one of the most fortunate coincidences of history that a challenge of such magnitude is before us. For in meeting the challenge of conservation we can demonstrate the importance of forestry to the country.

I am optimistic that forestry graduates of this college will meet this challenge squarely.

GREGORIO ZAMORA
Dean

THE GENERAL FORESTRY COMMITTEE—Sponsor of the National Conference on the Kaingin Problem including visiting professor of Forestry Extension.

*Left to Right*:Forester Nicolas Lansigan, President, Society of Filipino Foresters; Director Manuel Monsalud—Forest Products Research Institue; Regent Florencio Tamesis—General Manager, Nasipit Lumber and Representative. Forest Industries; Dean Gregorio Zamuco—U.P. College of Forestry, Chairman of the General Forestry Committee (1964); Prof. James E. Davis—Visiting Professor of Forestry Extension; Director Apolonio F. Rivera—Bureau of Forestry; Administrator Jose B. Viado—Reforestation Administration; Director Vicente de la Cruz—Parks and Wildlife Office; Mr. Fernando de los Reyes—Chief, Agricultural Information Division, DANR.

PART OF AUDIENCE DURING THE NATIONAL CONFERENCE ON THE KAINGIN PROBLEM, MARCH 12-13, 1964

In foreground (*left to right*): Director Manuel Monsalud—Forest Products Research Institute; Mrs. Lilia Salindong—Agricultural Information Division D.A.N.R.; Director Vicente de la Cruz, Parks and Wildlife Office; Don Antonio de las Alas, President, Philippine Lumber Producers' Association; Don Jose G. Sanvictores, Chairman of the Board, Aras-asan Timber Company and President, Philippine Association for Permanent Forests, Inc.

# Drainage of Logging Roads

*By*

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## INTRODUCTION

Drainage may be defined as the science of directing the removal of excess surface and ground water in such a manner as to safeguard the best interest of all concerned (2, p. 1)*. Its ultimate objective in roads is the prevention of damage or failure of the road surface and subgrade by the action of storm water, seepage, underground flow, and capillary rise (7, p. 53). The stability of roads is greatly affected by excess water due to the reduction of the soil-bearing capacity (20, p. 43).

The importance of drainage in any logging operation should be considered during the time of planning, design, construction, use and maintenance of roads. Sometimes a good road becomes impassable at a very vital time due to the absence or damage of a drainage structure. On the other hand, a poor road may be usable at such a time due to the presence of a good drainage structure (4, p. 4).

In the Philippines, the industry is very exacting in its demands. Log exportation and the growing veneer and plywood industries demand fresh and good-quality logs. In the tropics it is not a good practice to leave logs in the woods or landing for a long period of time to wait for good weather. They have to be moved and dumped into the log pond at the quickest time possible after felling to prevent or minimize the attack of pin-hole and bark borers. Hot logging requires logging roads to be maintained always in good condition for truck hauling regardless of the weather condition. And maintenance in logging roads is almost always in reference to drainage.

This paper is a bibliography of drainage structures ranging from the cheapest and most primitive to the most modern and expensive ones. Much of the information and data presented come from the review of available written material on road drainage and through observations and consultations by the author in the field in the Philippines, California, Nevada, Oregon, Washington, Montana and Idaho.

## HISTORY OF DRAINAGE

Drainage is one of the many contributions of the Romans to civilization. Its earliest use was in the reclamation of swamps, tidal marshes and flood plains for cultivation. The lands were kept dry by means of open trenches or covered drains filled with stones and brush (2, p. 1).

Just like most of the other Roman arts, drainage was lost for some time until its rediscovery in the 17th century. It was during this period that the need for more lands due to increasing population started (2, p. 1).

In 1823, the first corrugated metal pipe was invented by James H. Watson, a sheet metal manufacturer of Crawfordville, India-

* Numbers in parenthesis denote the references listed at the end of this paper.

na. The patent for this invention was granted on May 5, 1896 (18, p. 83).

Investigations on the strength of culverts were started by the Iowa Engineering Experiment Station of the Iowa State College in 1908 (3, p. 7), University of Illinois in 1909 (18, p. 84), the American Railway Engineering Association in 1923 (18, p. 84), and the University of North Carolina in 1924 (3, p. 11). These are the forerunners of the present day research on strength to adapt drainage materials to the changing conditions brought about by progress.

The invention of the first corrugated metal pipe resulted in the application of drainage in different fields such as municipal, airport, conservation, railway, highway and logging.

Progress in the form of improved means of transportation and the ever-increasing value of time, timber, water, soil, and other resources has brought about the discovery and use of new materials and processes (2, p. 1).

While the engineer of the past used heavy and massive materials, the modern engineer has in his command the use of lighter but stronger flexible materials (3, p. 1). Very recently aluminum was found to have a place in the road drainage field.

The drainage field should expect changing conditions that demand new materials as time goes by. Continuous progress makes it desirable to look for adaptability more than permanence (3, p. 3).

## CLASSIFICATION AND FUNCTIONS OF DRAINAGE

Drainage can be classified into three categories, namely: (1) surface, (2) subsurface, and (3) combination of surface and subsurface. This classification is based on the position of the water, whether on or below a particular point on the ground surface where it is first intercepted and collected prior to disposal (7, p. 53).

### *Surface Drainage*

Surface water includes stream flow, runoff from the surface of the area above the road, and water falling on the road due to precipitation. Without proper drainage these waters tend to stand or run on the surface of the road. This interferes with traffic, washes materials away, and induces erosion and injury to the road surface and subgrade (Fig. 1). The interception, collection and removal of these waters are the functions of surface drainage.

### *Subsurface Drainage*

Subsurface water is made up of the surface water that has infiltrated into the soil, usually in the form of seepage, springs, high water table, and capillary rise. Water on the road surface either percolates into the soil or is deflected laterally towards the sides, the amount being dependent on the velocity of percolation or deflection and the porosity of the soil (21, p. 44). Water continues to sink into the soil until the water table or the so-called "underground lake" is reached. A prime requirement of a good road is a good foundation. A saturated foundation is not stable while a dry one can almost bear any load. Sometimes subsurface drainage is divided into three groups depending on the function (7, p. 70-73):

1. Base—Takes care of the water in the subgrade beneath the surface course.
2. Subgrade—takes care of the water in the subgrade.
3. Intercepting—intercepts, collects, and removes the water flowing into pervious strata or from springs before it can enter the subgrade.

From these functions it can readily be seen that subsurface drainage is more difficult and complex than surface drainage, making installation of structures very costly.

*Combination of Surface and Subsurface Drainage*

It has been already stated that both surface and ground waters must be avoided. Oftentimes a system is used to collect and carry surface and subsurface waters together into a single structure for comparatively long distances (2, p. 8). The type of soil is an important consideration inasmuch as surface water is allowed to penetrate into the subgrade. Permeability is more apparent in gravel and sand than in clay.

## DRAINAGE STRUCTURES

*Surface Drainage*

The interception, collection and removal of surface water from a particular portion of the road surface can be accomplished by one or a combination of two or more of the structures discussed below.

*Crown.* Surface water is deflected to the side ditches by the provision of a crown or transverse slope. The center of the road being made higher than the sides or edges enables the shedding of surface water to the sides or edges and into the side ditches. Crowning is ideal for roads on flat ground and through-cut sections. The amount of crowning depends on the road surface, road gradient and type of surfacing material. The smoother the surface, the lesser is the crowning required. As a general rule, crowning for smooth surfaced roads is from 1/4 to 1/2 inch per foot, and from 1/2 to 3/4 inch per foot for gravel and other untreated surface roads (7 p. 389).

Table 1 is appropriate for the Philippines where heavy rainfall is prevalent.

Based on the surfacing material, the crowning shall be 1 in 18 for earth, 1 in 24 for gravel, and 1 in 32 for bituminous macadam (20, p. 20).

TABLE I.

The maximum crown based on grade recommended for areas of heavy rainfall (22, p. 141).

| Grade (Percent) | Height of crown at center | |
|---|---|---|
| | 9-ft. width (inches) | 16-ft. width (inches) |
| 0-5 | 2-1/4 | 4 |
| 5-10 | 1-3/4 | 2 |
| 10 and over | 1-1/4 | 2 |

*Superelevation.*—The primary purpose of superelevation is safety. It provides the counter-acting force against the centrifugal force acting on the vehicle by giving a gliding effect to the vehicle as it goes around the curve. Safety as a purpose of superelevation in logging roads is not as significant as in highways. Speed is not a factor to be concerned with in the logging business. Except for light vehicles, travel time is relatively slow. Drainage-wise, however, it takes care of the removal of surface water from the road surface on curves. The road surface is sloped upward toward the outside portion of the curve. It is expressed as the decimal fraction of a foot rise per foot of horizontal cross-section or as the tangent of the angle of the slope. Superelevation depends upon the radius of the curve and the speed of the traffic. For a particular superelevation along a curve of radius, R, the speed limit of the passing vehicles should be set (8, p. 1). Superelevation must not be so great that a stationary or slow-moving vehicle will slide downward when the surface is slippery. The AASHO recommends 0.08 where snow and ice are prevalent and 0.12 elsewhere (14, p. 137).

*Outsloping.* In sidehill locations surface drainage is made possible even without side ditching. This is done by outsloping the entire width of the road toward the downhill side. Surface water is allowed to flow across the road surface from the uphill side to the downhill side and away from the roadway. Inasmuch as additional cost of installing a culvert and ditch are not necessary, outsloping is favored in temporary roads. In addition, it reduces the width of the roadbed due to the absence of ditches thereby lessening the amount of land rendered unproductive. It could very well be in combination with cross-ditches and turnouts to ease up traffic. Generally, outsloping is from 1/4 to 3/8 inch per foot. The slope should just be enough to divert the water. It is greater than necessary when apparent to the eye (12, p. 9). However, sloping of at least five percent was observed in areas where the soil is very erosive.

*Insloping.* Insloping is very important where the soil is very erosive and water should not be allowed to drain to the downhill slopes, especially fill slopes. It is the opposite of outsloping as to position but the same as to the rate of sloping. The uphill side of the road being made lower than the downhill side enables the water to flow to the inside ditch and drains to a main cross-drainage structure, usually a pipe.

*Cross-ditch.* Cross-ditch is a depression constructed across an outsloped road at an oblique angle with the road center line. This prevents the two opposite wheels from being on the ditch at the same time. On an insloped section, as on a curve, the cross-ditch can be made as an extension to the inside ditch of the adjacent tangent. Width and length must be adequate to drain the water and not too great to endanger traffic at normal speeds. This structure should not be constructed to handle constantly running or live water. Cross-ditching at intervals along a road should be done when such roads are "put to bed" and will not be used for a long time after the first logging operation.

*Intercepting ditch.* In rough and mountainous locations a situation may exist in which there is a combination of erosible soil and a great quantity of water flowing down

the slope. Water velocity builds up with steepness and length of slope causing erosion and overloading of the side ditch below. It is necessary to reduce the amount of water carried by the side ditch as well as minimize the amount of soil carried by the moving water. The water source above the road should be cut off and drained to a main drainage structure beyond. This is the function of the intercepting ditch which is installed between the road and the water source to intercept the water before it reaches the road surface. The grade of the intercepting ditch should be the same as that of the road ditch. Stability of the ditch could be assured by providing rock or timber walls (21, p. 44). This structure reduces the erosion potential due to the construction of a terrace wherein it is established.

*Side ditch.* This is an open channel on the side of the road (one in a sidecast-balanced section or any sidehill location, and two in level, turnpiked and through-cut sections), and parallel with the road, used to dispose surface water flowing from the road surface and adjacent areas. This is the simplest, cheapest and most efficient means of handling surface water on the road. Its main disadvantage is that it could become a potential hazard to traffic when not properly installed and also increases the amount of land rendered unproductive. Minimum grades are 1 to 3 percent for sodded ditches and 2 to 5 percent for ditches with irregularities and checks in them (10, p. 27).

*Downspout.* In an outsloped road where the soil is very erosive that water should not be allowed to flow towards the fill slope, a downspout may be used at the bottom of a favorable grade or at a strategic point along a sustained grade. An ideal downspout is a culvert pipe laid along the fill slope and long enough to reach the bottom of the slope. An embankment of soil is maintained at the outer edge of the road to divert the water down the road and into the downspout instead of flowing directly towards the edges. Concrete or any stable material is used throughout the entire depression near the opening of the structure to avoid soil erosion and failure as water quantity and velocity are expected to be highest at that point.

The main disadvantage of this structure is its liability to get damaged during road surface maintenance. The concrete or any stable material installed near the opening of the pipe is subject to damage by the grader blade as the road surface is "smoothened."

*Ford.* A ford is an underwater crossing, usually used due to limitation of time, lack of suitable materials, and temporary use of the road. Although it is inexpensive and simple in construction, it requires extensive and expensive maintenance in the long run due to flash floods and heavy traffic. Fords should have solid approaches on both sides of the stream by applying gravel or shale on the approach sections (12, p. 11).

*Culvert.* Culvert is a conduit installed across and under the road used to carry and drain stream water as well as the water that has accumulated in the side ditch on the uphill side. It is a "grade separation" for the water and the traffic above it (3, p. 224). This is the most important and commonly used structure in any kind of road. Discussion of this structure is given more emphasis in the later part of this paper.

*Bridge.* Bridge is a structure spanning a natural waterway or stream whose floor is a continuation of the roadway or road surface at each side of the stream. The extensive study, design and construction make it the most expensive drainage structure (2, p. 245-246). Bridges of different types have been used consisting of well-designed and constructed structures of steel, and treated wood that are swaybacked, propped up, supported by discarded guy-lines, contraptions that represent the ultimate in loggers' ingenuity, resourcefulness and expediency (9, p. 43). In the logging industry, log stringer bridges are the most popular and commonly used. Local materials or species are readily available for stringers. The size of the stringers should be adequate to carry the maximum load with a factor of safety. Bridges expected to be permanent might better be "over-designed" to handle heavier and denser traffic in the future. Recently the low water bridge was introduced and was found to be feasible. It is a bridge of sufficient elevation to permit the free passage of water during the normal runoff and which during flood stages is low enough so that drifts carried by flood waters pass freely over it (9, p. 43). This type of bridge, however, requires a lot of stream study. The following are the key factors to consider in planning the type of bridge to be used (9, p. 43-44).

1. Volume of merchantable timber to be transported over the proposed bridge.
2. Future management of the forest lands behind the bridge.
3. Log production schedule from lands to be served by the bridge.
4. Flow characteristics of the stream.
5. Terrain characteristics of the proposed bridge site.

Bridge design and construction is a big field in itself and a detailed discussion is beyond the scope of this paper.

A question that usually arises whenever a permanent stream crossing is necessary is whether to install a culvert or a bridge. Construction of a bridge should only be done when there is no other way of crossing

the stream at a reasonable expense or with an adequate factor of safety. A bridge may be constructed if a culvert cannot handle the volume of water and if bridge construction is necessary for stream protection in the interest of other uses such as fishing, recreation, water supply, etc. Many field engineers consider the 8-foot culvert as maximum.

*Subsurface Drainage*

Somehow some of the surface water infiltrates into the soil. This affects the subgrade or foundation by the reduction of soil strength due to excessive moisture content. The presence of water below the road surface makes installation of subsurface drainage structures difficult and expensive. Moreover, the significance of their presence and function is oftentimes unnoticed due to their relative location.

*Subdrain.* A drainage line beneath the road surface used to collect and remove ground water from the subgrade is referred to as a subdrain. It is usually made of a perforated pipe enclosed in a filter layer of sand or gravel when installed to permit the ready draining or infiltration of the water. The structure is usually placed two feet or more below the road surface in trenches and backfilled with a selected filter material to some depth over the top of the pipe. It is provided with an impervious material in the top part of the trench. Drains of 6 to 8 inches in diameter are satisfactory except where intercepting lines and extreme ground conditions exist.

*Vertical well.* The vertical well is an artificial means of lowering a high water table that remains at a height that affects the stability and bearing capacity of the subgrade, increasing the rate of flow of slow-moving subsurface water, and permitting the passage of trapped subsurface water through an impervious soil layer that is created when the soil is tamped during the formation of the roadbed. The well that is bored through the impervious strata into the porous strata should be back-filled with sand and other porous materials. (11, p. 332).

*Combination of Surface and Subsurface Drainage*

Drainage structures, like storm sewers, for the collection and disposal of both surface and subsurface water are rarely used in logging roads. The system is extensive and long, intended to carry water for longer distances. Installation is only justified in permanent and extensive construction, such as city streets, airports, railroad yards, etc. Further discussion therefore is unnecessarily in this paper.

## CULVERTS

In general, availability of material is the chief factor to consider in the Philippines when installation of a culvert is necessary. This is particularly true in small operations where the road is usually expected to be used only during the first cutting cycle. It has been observed by the author that some operators even disregard drainage and other important engineering requirements of a good logging road in order to avoid the big item of cost of material and construction.

Long life of the road is the important factor in big and permanent operations. There is usually a choice between a low initial cost of construction but a higher cost of maintenance in the long run, and a high initial cost of construction but lower maintenance cost afterwards.

The situation in the Philippines is such that better and permanent structures like corrugated metal pipes are not readily available. If they are available, the operator is still faced with the problem of high cost of material and transportation from the market or plant to the logging area. It is for this reason that most operators make use of the available local materials first with the intention of replacing them with better and more permanent ones or with the same kind of materials later on.

*Classification of Culverts*

Culverts are classified according to degree of flexibility, construction conditions, and materials.

*Flexibility.* Classification based on degree of flexibility are as follows: (3, p. 7)

1. Rigid—Examples are concrete, cast iron or clay. The principal load-supporting ability lies in the inherent strength or stiffness of the pipe.
2. Flexible-Examples are corrugated metal pipes and thin-walled steel pipes.

The vertical pressure is greater in the rigid than in the flexible and vice versa as to unit side pressure (18, p. 84).

*Construction conditions.* Classification based on construction conditions follows: (3, p. 8).

1. Trench—The culvert is entirely buried in a narrow trench in relatively passive or undisturbed soil.
2. Projecting—The structure is installed in shallow bedding with the top of the culvert projecting above the surface of the natural ground, and then covered by an embankment.
3. Negative Projecting—Culverts placed in a shallow ditch at one side of the existing water course with the top of the structure below the natural ground surface and then covered by an embankment above this ground level.

*Materials.* Classification based on materials follows:

1. Box—Box culverts are the most commonly used in logging roads especially in small and temporary operations. It is cheap due to the simple design and installation necessary. However, life is short, especially in the tropics, due to decay, termites and other wood-destroying insects. If possible, materials should be treated with wood preservative to increase its life in service. Box culverts are either open-top or closed-top and are to be designed to prevent side and roof collapse. The cross-section is usually square or rectangular. The following is a classification based on the material used:
   a. Log—Cull logs instead of being left to rot in the woods could be used for box culverts. A pair of these whose size and distance from each other depend on the size of opening desired are laid parallel to each other across the roadway and in the general direction of the natural waterway. Then, additional pieces are crosslaid over them and covered with soil.
   b. Lumber—Four pieces of rough lumber are joined together to form a square or rectangular cross-section. Round timber in the area when split or sawed could serve the same purpose.
   c. Pole—A box culvert made of two or three poles laid side by side and spiked in place to cross-members serving as a base. The culvert produced is open-top.
2. Pipe—Pipe culverts are made of materials ranging from the most common and primitive to the most modern and permanent ones, such as:
   a. Timber—Oftentimes, timber in its natural form is used. Interior defects especially center rot which occur in some of the bigger and more nature Dipterocarpaceae (Philippine Mahogany family) species are in the form of a hole in the center of the log. In the case of center rot, the hole may extend from one end to the other making the log a natural drainage pipe.
   b. Drum—Improvisation is typical of the logging industry. Empty gasoline, oil and asphalt drums can be used by removing their tops and bottoms and joining them together end to end.
   c. Concrete—Concrete pipes, either reinforced or plain, are commonly used in highways but not very much in

Fig. 1— Road surface and subsurface failure due to the action of excess water.

Fig. 2— An 8' arch CMP substituting for a bridge.

Fig. 3— A battery of arch CMP used instead of a bridge.

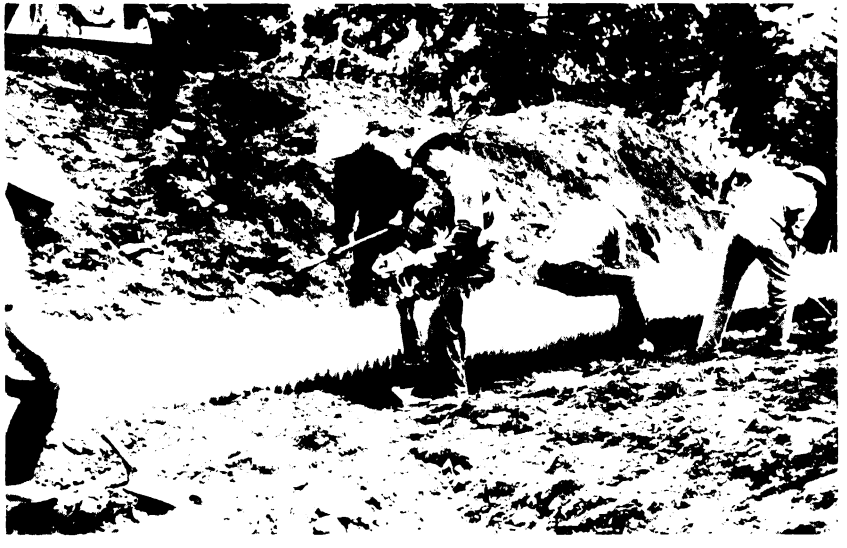

Fig. 4— Installation of a CMP culvert.

Fig. 5— "Half-moon" CMP used as downspout.

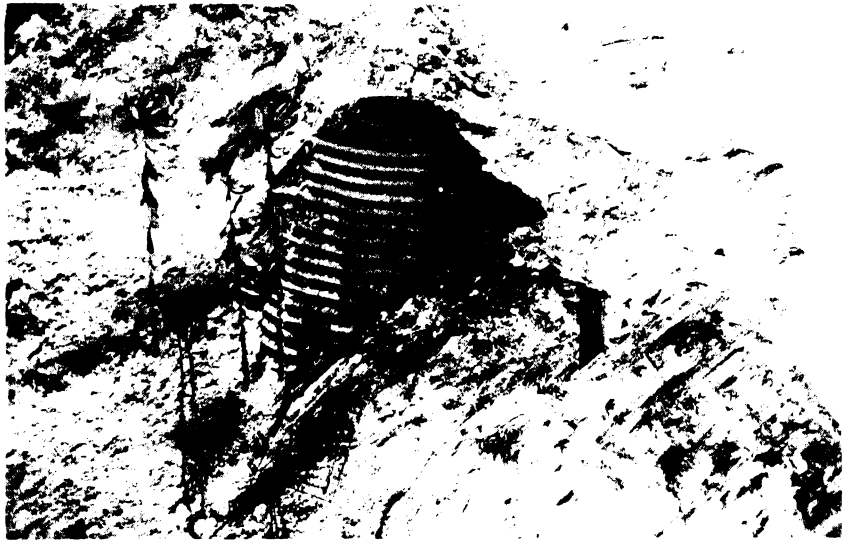

Fig. 6— An open-top Drop Inlet.

Fig. 7— Digging-up a culvert to remove silt and debris.

logging roads. Although they have the advantage of long life, strength and durability, they are bulky, expensive and not readily available in most logging areas.

d. Corrugated Metal—The most popular drainage structure nowadays is the corrugated metal pipe. It is even capable of outlasting the road where it is installed. Its length and cross-section are flexible, distributing the load and making the structure carry less vertical pressure. The corrugation of the surface, either plain or vertical, adds more to its strength. Its weight is light and installation is further made simple by the provision of couplings. These make installation not only easy but also inexpensive. As compared to other structures its overall cost per year of service is much less. The initial cost is easily offset by the low installation cost, freedom from constant upkeep and repair and long life. Sometimes corrugated metal pipes of considerable size and number can substitute for a bridge (5, p. 64-65) (Figs. 2 & 3). Where there is no sufficient headroom for a pipe or where aesthetic considerations are important requiring minimum excavation and low fills, an arch or pipe arch culvert may be used (3, p. 87).

It is rather unfortunate that corrugated metal pipes are still very rare if not completely absent in the Philippine logging scene. Obviously, economics is the main reason. It is however hoped that such a case is only temporary.

## LOCATION OF DRAINAGE STRUCTURE SITE

Proper location of culvert and similar structures is very important because it affects the adequacy of the opening, maintenance, and possible washout of the structure. Alignment and grade with respect to both the roadway and stream are the main considerations (3, p. 241). The stream should have a direct entrance and a direct exit to avoid slow flow that may require a bigger structure. Precautions should be observed as to the possible change in the stream flow near the end of the culvert. Otherwise, the culvert may become inadequate and possibly be washed away (3, p. 243). The ideal grade for a culvert is one that produces neither silting nor excessive velocities and scour, one that gives the shortest length and one that makes replacement simplest.

Location of drainage sites should never be dictated by any arbitrary rule. They should be installed after a thorough field examination where they are needed regardless of the distance from each other and other considerations. Locations include natural waterway crossings, point of change from favorable to adverse grades and a strategic point along a long sustained grade where the water from the inside ditch can be drained across the road.

## DRAINAGE DESIGN

The design of drainage structures is primarily based on the sciences of hydraulics and hydrology. Hydraulics is the science dealing with the flow of water while hydrology deals with precipitation and runoff. Precise computations of structure capacity and discharges are very much affected by numerous factors and variables, some of which are not even included in the emperical formulas commonly used. Engineering judgment based on experience and available information is indispensable in getting a balance between over-designing which is uneconomical and under-designing which would result in failure (15, p. 195).

### *Preliminary Considerations in Drainage Design*

The designing engineer is confronted by important factors or considerations at all times such as topography, road location, the

engineering material, road standard, present and future use of the road, and climatic factors.

*Important relationships.* The following are some important relationships that the designing engineer is expected to be well versed on: between drainage and factors associated with the general location of the road, the grade of the road and the position of the structure (particularly referred to culverts) itself.

1. Drainage and Road Location—Ridgetop locations are the best to drain. Water can be diverted directly towards the edges of the road by crowning. Roads in sidehill locations are also easy to drain by out-sloping especially if the soil is stable enough to withstand the erosive action of water flowing into the outer edge of the road. With erosive soils, drainage can be accomplished by a combination of insloping and cross-drain. On the other hand, level and throughcut sections are difficult to drain and may require an extensive and numerous drainage system and structures.

2. Drainage and Road Grade—In road construction it is not desirable to have long level sections and too steep grades. In rough topography too steep grades in excess of 15 perecent increase hauling and maintenance costs. There is also a need for a proper drainage system in this kind of road because the erosion potential is increased by the tendency of the water to build up in amount and velocity down the grade. Long level sections also make drainage difficult. Water tends to stand on the road surface and side ditches with the liability of wetting the subgrade. As a general rule, a minimum grade of 2 to 5 percent is much more desirable than zero percent and a maximum grade of not more than 10 percent should be maintained. A maximum grade of 15 to 20 percent may be allowed for short distances (12, p. 1).

3. Conduit Inclination—Internal pressures (known as "head") exerted by water are either brought about by differences in elevation in various parts of the conduit or by pumping (3, p. 32). A conduit except in extreme cases should not be allowed to run full or "under a head". The grade of the conduit should not be so great as to subject the structure to a considerable "head" especially during flood periods. This causes erosion at the lower end of the structure and at the same time causes damage to the adjacent fill. On the other hand, the grade should not be level all throughout the length of the structure due to the tendency of water to stand still or flow very slowly inducing sedimentation (2, p. 193). A minimum grade within the neighborhood of five percent may be recommended. If the culvert is not placed directly in the water course, a grade of 8-10 percent may be used. The grade of the culvert should be steeper than that of the road ditch if the culvert is to drain the water from the road ditch (23, p. 7e). The erosion potential of the fill adjacent to the end of the culvert can be minimized by having an additional length of at least two feet of the culvert extend from the toe of the fill.

*Type of installation.* The use of the road determines the type of installation of drainage structures. An all-weather or permanent road for long-term use necessitates a detailed drainage design. This includes roads classified as temporary at the time of construction but where improvement or expansion is anticipated in the future (7, p. 56).

*Topographic data.* The site as well as the adjacent areas should be accurately defined in the topographic map. Drainage area is best obtained from a large scale topographic map. Aerial photos are also used especially when a topographic map is not available. Topography greatly influences the rate of runoff and the number and size of the drainage structure necessary to drain the area (7, p. 57).

*Soil type.* Soil is the basic construction material for roads. Yet, it has often been neglected or taken for granted. This neglect can be shown by high maintenance cost, surface and subgrade failures, slides and washouts and interruption of traffic. All of these are due to the presence of excess water which is the natural enemy of the road. Among the properties of soil, capillarity and permeability are the most important in connection with drainage. As a general rule, soil with low capillarity and high permeability are ideal for drainage purposes (15, p. 150).

*Hydrologic factors.* (15, p. 196-197)

1. Precipitation—The estimate of peak discharge is based on rainfall records which may be obtained from the Weather Bureau, and from local agencies maintaining rain gauges. Data required are intensity, duration and frequency.

2. Runoff—Runoff data may be obtained from the Geological Survey and other agencies maintaining stream flow gauging stations. The run-off of a given rainfall from a drainage area is affected by the size of the drainage area, topography, soil and vegetative cover. There is a need for the application of a coefficient or factor on vegetative cover. From studies made in the Rocky Mountains, it is estimated that clear-cutting a forested drainage area increases runoff by about 30 percent during the first year. Runoff decreases as the area is re-vegetated.

*Character, direction and magnitude of the load.* Any structure is subject to loads of various character, direction and magnitude. The materials that make up the structure constitute the dead load while moving vehicles constitute the live load. Wind load, although not so important, may be considered in some designs. The pressure exerted by loads may be vertical or transverse. Design, therefore, should take into consideration these main factors together with the expected magnitude and an adequate factor of safety.

*Physical properties of the material of which the structure is made.* Flexible materials receive lesser vertical pressure than the rigid ones. The reverse is true as to unit side pressure. The principal load-supporting ability of rigid materials lies in their inherent strength or stiffness. On the other hand, flexibility of a material, as in corrugated metal pipes, distributes the load making the structure carry less vertical pressure.

*Behavior of the material under loads and stresses.* A flexible material has the capability of adjusting itself to the amount of loading. Initially the heavy load and the stable soil on which the structure rests tend to compress the structure. Although there will be a reduction in the clearance, the bearing surface of the structure is increased. This distributes the load over a bigger area until the whole structure can well support such a load. This case does not hold true in structures made of rigid material. The structure may either support the load without any marked change in its original state or collapse under it depending on its inherent or designed strength.

*Size of opening required.* The structure (pipes in particular) should be of the right size to accommodate the amount of

TABLE 2.

Drainage table based on Talbot's Formula for a 2-1/2 inch per hour rainfall.

| Number of acres | Impervious 100% runoff | Steep slopes heavy soils moderate cover | | Moderate slopes heavy to light soils dense cover | | Gentle slopes agricultural soils and cover | | Flatland pervious soil |
|---|---|---|---|---|---|---|---|---|
| | Area in square feet required for water way | | | | | | | |
| | C = 1.00 | C = .80 | C = .70 | C = .60 | C = .50 | C = .40 | C = .30 | C = .20 |
| 2 | 1.0 | 0.8 | 0.7 | 0.6 | | | | |
| 4 | 1.7 | 1.4 | 1.2 | 1.0 | | | | |
| 6 | 2.3 | 1.9 | 1.6 | 1.4 | 1.2 | 0.9 | 0.6 | |
| 8 | 2.9 | 2.3 | 2.0 | 1.7 | 1.4 | 1.2 | 0.9 | 0.6 |
| 10 | 3.4 | 2.7 | 2.4 | 2.0 | 1.7 | 1.4 | 1.0 | 0.7 |
| 20 | 5.8 | 4.6 | 4.0 | 3.5 | 2.9 | 2.3 | 1.7 | 1.2 |
| 30 | 8.0 | 6.3 | 5.4 | 4.8 | 4.0 | 3.2 | 2.4 | 1.6 |
| 40 | 9.8 | 7.8 | 6.8 | 5.9 | 4.9 | 3.9 | 3.0 | 2.0 |
| 50 | 11.6 | 9.3 | 8.0 | 7.0 | 5.8 | 4.6 | 3.5 | 2.3 |
| 60 | 13.4 | 10.7 | 9.2 | 8.0 | 6.7 | 5.3 | 4.0 | 2.7 |
| 70 | 15.0 | 12.0 | 10.3 | 9.0 | 7.5 | 6.0 | 4.5 | 3.0 |
| 80 | 16.6 | 13.3 | 11.5 | 10.0 | 8.3 | 6.6 | 5.0 | 3.3 |
| 90 | 18.2 | 14.6 | 12.5 | 11.0 | 9.1 | 7.2 | 5.4 | 3.6 |
| 100 | 19.7 | 15.8 | 13.5 | 11.8 | 9.8 | 7.8 | 5.8 | 3.9 |
| 150 | 26.9 | 21.2 | 18.5 | 16.0 | 13.3 | 10.7 | 8.0 | 5.4 |
| 200 | 33.2 | 26.8 | 22.9 | 20.0 | 16.7 | 13.3 | 10.0 | 6.6 |
| 250 | 39.5 | 31.5 | 27.1 | 23.8 | 19.7 | 15.7 | 11.8 | 7.9 |
| 300 | 45.7 | 36.1 | 31.0 | 27.1 | 27.0 | 18.0 | 13.5 | 9.0 |
| 350 | 51.0 | 40.6 | 35.0 | 30.5 | 25.3 | 20.2 | 15.0 | 10.1 |
| 400 | 56.0 | 45.0 | 39.0 | 33.9 | 28.0 | 22.2 | 16.7 | 11.2 |
| 450 | 61.7 | 49.7 | 42.0 | 37.0 | 30.6 | 24.2 | 18.0 | 12.3 |
| 500 | 66.8 | 52.8 | 46.0 | 40.0 | 33.2 | 26.5 | 19.8 | 13.2 |
| 600 | 77.0 | 61.6 | 52.5 | 46.0 | 38.2 | 30.3 | 22.8 | 15.3 |
| 700 | 86.0 | 68.4 | 59.5 | 52.0 | 43.0 | 34.0 | 25.8 | 17.2 |
| 800 | 96.0 | 76.1 | 65.8 | 57.0 | 47.5 | 38.0 | 28.5 | 19.0 |
| 900 | 104.0 | 83.0 | 71.7 | 62.2 | 51.9 | 41.5 | 31.1 | 20.8 |
| 1000 | 113.0 | 90.0 | 77.7 | 68.0 | 56.5 | 45.0 | 33.7 | 22.4 |

water to be carried through it. It is also important for economic reasons that the size should not be bigger than necessary.

*Determination of Culvert Size*

Size refers to the amount of opening that is required of the culvert to drain an area. The size should not be bigger than needed necessitating a bigger and more expensive pipe and not so small that it may bring about total failure or expensive maintenance later on.

*By experience.* The most practical method of determining the proper size of a culvert is to investigate old culverts in the proposed site. If no culvert had been installed on the proposed site, any culvert upstream or downstream should be inspected to determine how much water it was required to carry. In the absence of any culvert in the area, a culvert in another area may be used provided the conditions or rainfall, topography, soil and vegetation are comparable. Information to be noted should include the length, diameter, and slope of the culvert; height of flood water marks with reference to the culvert inlet; any erosion at the outlet; siltation; and size and character of the drainage area. The computed culvert size could then be compared with the size of the culvert inspected (15, p. 198-199).

*By empirical formulas.* Empirical formulas are used entensively to determine the approximate opening required. These formulas are based on a large number of observations of culverts that have proved to be capable of carrying water from watersheds of various general characteristics (2, p. 194). Among the many formulas, the Talbot and Manning Formulas are the most popular and commonly used.

1. Talbot's Formula is noted for its simplicity. It emperically predicts stream flow by measuring the watershed area and estimating a coefficient. In practice, the limiting factor to its accuracy is the wide variation of the coefficient in adjacent watersheds (6, p. 2).

$$A = \sqrt[4]{M^3}$$

Where:

A— Waterway area necessary, in square feet

M—Area drained, in acres

C—Topography coefficient, 1/5, 1/3, and 1 for flat, rolling and mountainous areas, respectively.

Tables 2 and 3 give the diameter of culvert based on waterway area required considering different coefficient of roughness (10, p. 36).

TABLE 3.

Sizes of round pipe needed for areas of water way listed in drainage table.

| Area (square feet) | (inches) Diameter |
|---|---|
| 1.25 | 15 |
| 1.80 | 18 |
| 3.10 | 24 |
| 4.90 | 30 |
| 7.10 | 36 |
| 9.60 | 42 |
| 12.60 | 48 |
| 15.90 | 54 |
| 19.60 | 60 |
| 23.80 | 66 |
| 28.30 | 72 |
| 33.20 | 78 |
| 38.50 | 84 |
| 44.20 | 90 |

Studies in Western Oregon show that the coefficients in Table 2 don't always give realistic results. This may be due to the fact that no two places or areas have the same conditions. Further study of coefficients is therefore necessary based on actual conditions in the Philippines.

2. Manning's Formula was first published in 1890 (3, p. 206). The stream

flow is determined by the measurement of three factors and an estimate of another.

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

and

$$Q = A\left(\frac{1.486}{n} R^{2/3} S^{1/2}\right)$$

Where:

V— Velocity, in feet per second

Q—Discharge, in cubic feet per second

A— Cross-sectional area of flow, in square feet

R— Hydraulic radius, in feet

$$R = \frac{\text{area of section}}{\text{wetted perimeter}}$$

S— Slope or grade, in feet per foot

N— Coefficient of roughness (see Table 4).

TABLE 4.

THE VALUE OF n FOR DITCHES

| Type of lining | n |
|---|---|
| Ordinary earth, smooth graded | .02 |
| Sod, depth of flow, over 6 inches | .04 |
| Sod, depth of flow, under 6 inches | .06 |
| Type A riprap, rough | .04 |
| Concrete paved gutter | .016 |

The main disadvantage of using Manning's formula is that the coefficients of roughness listed in Table 4 are based on man-made channels rather than on the typical logging conditions.

The coefficient of roughness is very significant in the use of the two formulas mentioned in this paper. A mistake, however slight, can throw the estimate of culvert size either two small or too big. The variation of culvert size becomes greater with large streams.

Charts giving the discharge, depth and velocity for various bottom widths, and for various flat side slopes can be found in reference number 3. Capacity tables can also be found in King's "Handbook of Hydraulics"; U.S. Bureau of Reclamation and Excavation Tables; and Department of Agriculture and University of California Extension Service, "Hydraulic Elements of Trapezoidal Channels."

*Hydraulic design.* The size of culvert for the given hydraulic condition is computed or read from charts after the design peak discharge is estimated. Peak discharge is estimated from (a) drainage area, rainfall and coefficient for topography and (b) stream flow measurement (15, p. 198).

The third method is not as popular as the first two mainly due to its complexity.

*Determination of Culvert Length*

The width of the roadbed, height of fill, slope of the embankment, slope and skew of the culvert, and the type of end finish (such as end section, headwall, beveled end, drop inlet or spillway) determine the length of the culvert (3, p. 245). As a general rule, an extra length of two feet from the edges of the roadway is recommended to avoid clogging of the ends by sediment and to minimize the erosion of the fill slope. On the other hand, ends which are too long are a waste.

Perhaps the best way to determine the length is from a cross-sectional sketch of the embankment and a profile of the stream bed. In the absence of these, the following formula may be used: (2, sect. 18 p. 29).

$$L = A + 2B + C$$

Where:

L— length of culvert (excluding overhang)

A— width of the roadbed

B— sideslope ratio X D

D— depth of fill at inlet

C— slope ratio X 1.5 fall or culvert gradient

Big companies usually keep an adequate inventory of corrugated metal pipes to keep up with the road program and to get a discount by buying in large quantity. The question to ask is: What would be the standard length of all these pipes. The road engineer of the biggest logging company visited by the author during the summer of 1962 recommended 28 feet as standard. Addition or removal of CMP sections or links take care of the desired length afterwards. Of course, multiplates come in individual short links and are joined together in the area.

## INSTALLATION OF CULVERT AND SIMILAR STRUCTURES

A bulldozer is conveniently used to dig the depression where the culvert is to be laid. In the case of a complete fill, the depression of sufficient width and depth should be left with adequate fill material placed on the adjacent banks. Shovels and other hand tools are then used to get the desired depth at all points seeing to it that all points along the bottom of the pipe touch the surface of the bed. The distance from the surface of the culvert to the final road surface should be at least two feet at the highest point. The bed should be free of rocks and debris and tamped thoroughly before putting the pipe in place. The desired rate of fall or inclination is determined by the use of a hand level or abney and rod. The pipe is then covered partly at its sides and tamped carefully and thoroughly by shovels or a mechanical tamper (Fig. 4). Again, rocks and debris should be eliminated until the culvert is entirely covered with fill materials pushed by the bulldozer. Compaction and stability of the soil is very important to prevent bending and failure of the structure.

Riprapping with rocks is necessary around the outside surface of the opening of the culvert to make it more stable and to prevent or minimize the amount of water entering through the sides adjacent to the culvert. The waterway may be deepened and made narrower towards the pipe entrance. If two or more pipes are installed, riprapping around and between the pipes is necessary and may even necessitate the use of concrete.

## SPECIAL STRUCTURES USED WITH CULVERTS

Proper drainage does not end with the removal of the excess surface and ground water from the roadway. Productive top soil and silt are bound to be carried by the water towards vital watersheds and streams thereby affecting the quality of usable water for people, fish and other forms of life. The following are structures that can prevent or minimize erosion and siltation:

### *Downspout*

In balanced sidehill sections and in high fills, one end of the pipe (the outlet) is usually way up from the bottom of the fill slope. Water falls on the fill slope causing erosion. Installation of a gutter on the fill slope is impractical and expensive. It requires the use of concrete or riprapping of stones. A wooden trough may be used but its short life makes it unsuitable with permanent installations. However with temporary structures such as wooden box culverts, it is ideal. A downspout in the form of another individual pipe or half-pipe (Fig. 5) should be long enough to reach the bottom of the fill slope. The use of this structure eliminates the required extra length of the main pipe. In the case of a whole pipe, a standard elbow joint with connecting band is used to connect it with the main pipe. "Half-moon" pipe serves the same purpose and it has the advantage of being cheaper. Instead of the elbow, bolts are

used to fasten it to the main pipe. The use of the elbow makes maintenance or the removal of dirt from the whole pipe system difficult. The elbow may be eliminated by attaching the downspout at the point before the end of the main pipe where an outlet is cut to allow water to flow into the downspout. To prevent the water from flowing through the end of the main pipe, a detachable stopper would come in handy. It is easily detached when it is time for the removal of dirt inside the main pipe.

*Water Spreader*

The water discharged by the downspout exerts great impact on the soil below. The water spreader is a bedding or layer of small rocks held in place by a wire netting and wooden bracing. This makes the water fall on the rock layer, distributing it over a larger area before penetrating into the soil.

*Drop Inlet*

A great portion of the silt that gets into a cross-drainage pipe used to drain the water from the side ditch comes from the cut slope above it. A drop inlet (Fig. 6) could reduce the amount of soil that falls and enters into the main pipe. The structure is mainly a shorter piece of pipe whose diameter is bigger than that of the main one so that it encloses the main pipe at the end when installed vertically and inserted through the cut made at one of its sides. The side of the drop inlet facing the cut slope should be as high as possible while the two side facing the general direction of the ditch should be at the same level with the ditch. This open-top drop inlet would still allow dirt to go through. A closed top drop inlet can be installed by having a detachable stopper or lid on its evenly-cut top. Water from the ditch enters the main pipe through a cut made at the side of the drop inlet facing the ditch.

## SOME WAYS OF STRENGTHTENING AND PROLONGING LIFE OF CULVERTS

The design of culverts as to proper size and length is not the end. Common sense would tell that failure may be caused by the load that the culvert must carry in relation to its size and some types of soil have the inherent capability to shorten the life of the culvert. The following are some of the means of strengthening and prolonging the life of metal pipes.

*Inside Supports*

Pipes, especially big ones and installed under heavy fills, may collapse or fail due to the heavy load above them. Inside supports or struts may be provided by installing vertical wooden pieces at the center throughout the entire length of the pipe. These vertical supports rest upon two horizontal wooden pieces placed as bases at the top and bottom inside faces of the pipe. These supports or struts obviously encourage clogging of the culvert with debris. They have to be removed when the fill around and above the pipe has finally attained a more or less stable state.

*Preservative Treatment.*

The life of a metal pipe may be prolonged by treating the outer and inner surfaces with coal tar. This may be important for pipes installed in permanent waterways which are very much affected by the action of rocks and water. Rocks pound against the bottom edge of the end of the pipe producing rust which little by little spreads throughout the entire length. In addition, some soils are very corrosive to certain metals from which culverts are made.

## MAINTENANCE OF DRAINAGE STRUCTURES

Maintenance is very important if any drainage structure is to last long and function efficiently. This goal can be attained through adequate maintenance inspection

followed by the proper maintenance work. In pipes, the work consists mainly of the removal of debris and silt usually by the use of water pumps. Sometimes, the whole pipe has to be dug-up when siltation is very severe (Fig. 7). In ditches, maintenance involves the repair of washouts and the removal of debris. A road grader is a very efficient machine to obtain the proper ditch slope and to re-establish the back slope of the ditch (10, sect. 18, p. 33).

Actually the intensity of maintenance depends on the original design and installation of the structure. Erosion and siltation are dependent on the fall or inclination of the culvert and its position relative to the stream.

Maintenance of the road surface has a definite relationship with the drainage structure beneath it. The amount of surfacing should never be less than the original to avoid the structure from sticking out of the road surface.

## SUMMARY

Logging in the most practical sense is log transportation. And transportation almost entirely requires good roads whether it be motor truck road or railroad.

In the Philippines or any other tropical country, the logging industry is faced with two big problems—heavy rainfall and wood-destroying insects. The ability to maintain a "dry" road surface determines to a large extent the amount of fresh and beetle-free logs moved from the woods to the log pond in the quickest time possible after felling. These are equitable to maximum money value in the bank. In addition, proper drainage minimizes road maintenance cost that would otherwise add some more to the tremendous cost incurred in the construction phase. Sometimes companies have to depend on less maintenance cost so that the recovery of the capital tied up with the road will constitute adequate returns.

The choice of one or a combination of the structures discussed should depend on the size and nature of the operation, availability of material, durability, cost, and extent and size of the drainage area.

Drainage is the most important part of road engineering that must be considered at all times—in planning, design, construction, use and maintenance of roads. One has just to "look under the road" to obtain an adequate evaluation of any road and its engineer. It is said that drainage alone is a very important determining factor as to whether a certain logging operation can go on and on.

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# The Utilization of Weed Species and Wood Waste from Lumber and Plywood Mills

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## INTRODUCTION

Much waste is incurred in the harvesting of the trees in the forest and in converting them into useful forms and products. In logging operations, waste occurs not only from the trees that are harvested but also from those in the surrounding residual stand.

In a preliminary logging waste study conducted by the Forest Products Research Institute in Basilan Island, it was determined that for every 100 cubic meters in net volume of trees felled, bucked and yarded in that locality, approximately 50 cubic meters of wood waste and residue were left in the cutover areas. Again, waste is developed from logs brought to the mills in the manufacture of lumber, veneer and plywood, to mention only the primary products from wood. With the present practice of lumber manufacture in the Philippines, about 50 percent of the wood processed goes to waste in the form of slabs, edgings, trimmings and sawdust. In the manufacture of veneer and plywood, it was found that the average yield of veneer from a good-sized log is only about 47 percent of the volume of the log. Additional waste is incurred in the conversion of veneer into plywood, which brings down further utilization percentage to as low as about 25 percent of the log volume.

It is reported that there are about 3,800 tree species in the Philippines, and of this number only less than one hundred species are being utilized commercially at present. So, there are still more than 3,700 non-commercial species of wood that are not used but which can be tapped to bolster our economy if commercial uses for them can be found.

The following is a discussion of the possible uses of wood waste and weed species, and indicates what the Forest Products Research Institute is doing in this direction.

## SAWMILL WASTE

First, let us take a look at the tremendous amount of wood waste that is developed in some 321 lumber mills, which operate in the Philippines today. We have not gathered sufficient data on wood waste for the whole country thus far, but for the purpose of this discussion, the figures we have gathered would possibly suffice. In Manila and suburbs for example, there are 28 sawmills which actively operate on the average of nine months during the year. These

[1] Chief, Industrial Investigation Division

mills turn out approximately 4,500 cubic feet or 130 cubic meters of solid wood waste in the form of slabs, edgings, and trimmings and 5,800 cubic feet or 180 cubic meters of sawdust daily. So, right in the Manila area, there is roughly 30,000 cubic meters of solid wood waste and 40,000 cubic meters of sawdust that are available annually for processing into useful products. The wood waste developed in hundreds of lumber yards and remanufacturing establishments in Manila and suburbs is not included in this estimate. This raw material could very well supply, for continuous yearly operation, at least one fair-sized pulp and paper factory and a sawdust processing plant or a particle board factory in Manila.

Other centers of population which have a number of sawmills similarly concentrated as in Manila, are Butuan City, where 18 lumber mills are operating, Zamboanga City with 13 mills and Davao City with 12 mills.

## WASTE IN VENEER AND PLYWOOD MILLS

Waste in veneer and plywood manufacture comes in the form of log ends, also called "lily pods" in the trade, log centers otherwise known as bolt cores, edgings, trims and sawdust. It may exist in the form of low grade products because of improper peeling, careless handling, and defective drying and gluing. It may also occur in the form of brash veneer, compression or tension wood, etc.

Contrary to popular opinion, the amount of this waste is very great. In a study conducted at the U.S. Forest Products Laboratory in Madison, Wisconsin, it was found that the average yield of veneer from a yellow birch log is only about 47 percent of the volume of the log. In preliminary studies undertaken at the Forest Products Research Institute, good quality logs yielded an average of 60 percent of the original volume. The conversion of the veneer into plywood entails additional waste which ultimately lowers the percentage of plywood recovery to as low as 25 percent.

## UTILIZATION OF WOOD WASTE AND WEED SPECIES

There are several economic uses of wood waste and weed species in the Philippines. By economic use, we mean the conversion of the raw materials into articles that could be marketed profitably. This means that there must be sufficient demand for the product at a price which is adequate to pay its way to the consumers plus a reasonable profit for the effort and investment. These conditions depend, basically, upon the level of economic conditions of the country in general and in the case of some products, upon the progress of experimentation and research on forest products utilization, in particular.

### *Solid wood waste*

Solid wood waste is generally used for firewood, both for personal and industrial purpose. This is in the form of slabs, trims and edgings that are sold by the sawmill operators to firewood dealers at ₱55 to ₱60 per truck load, picked up at the mills in Manila.

In Sibul, Bulacan, two sawmill operators cut and bundle their solid wood waste for firewood on the contract basis. During the rainy season, from June to November, when the mills are shut-down for lack of logs, they concentrate on the firewood business which not only gives each of them an income that ranges from ₱7,000 to ₱10,000 annually, but also, it provides job opportunities to as many other people as are employed in the sawmills.

The situation in Manila calls for more enterprising people with enough capital to start some sort of wood shops that may produce handles of brooms and kitchen utensils, furniture, toys, coat hangers, and other

low-cost but commonly used wood products from slabs and other forms of solid wood waste. Establishments of this kind need not be big at the start. They could be of the cottage level at the beginning with few people and a couple of simple woodworking equipment in them. Similar establishments could also thrive in other centers of sawmill concentration such as Butuan City and Davao City.

Salvaging of slabs and edgings, as well as defective and form-grade lumber, for remanufacture into shorts and narrows,[1] is a common practice of lumber dealers. The S & N pieces, as the shorts and narrows are called, are generally planed on four sides and sold by the piece or by the bundle.

A few years after liberation, an enterprising man opened a very humble business venture in Sampaloc, Manila. He bought slabs, edgings, and low grade stock, damped them in his backyard, bought a second-hand table saw, and started a lumber business that was to become a going concern in less than ten years. Today, that Filipino runs a much bigger lumber yard than what he started, owns some items of remanufacturing equipment and sells other construction materials besides lumber. His business foresight and strong faith in his ability to do a good job made him successful in a business that is completely dominated by aliens.

The Philippine Wallboard Corporation was the first to establish in 1957 a hardboard plant at Nasipit, Agusan, which utilizes forest and mill waste and also weed species as raw material in processing its own "hard wood board", popularly known in the market as "Lawanit". This was the first and great single advanced step in the waste-utilization program in this country.

The next big step in the wood wastes utilization program was realized in 1962 with the establishment of a particle board plant by Timber Exports, Inc. at Baliwasan, Zamboanga City. Particle board panels are processed from veneer bolt cores, log butt trimmings and other solid wood waste and residue. In Europe, particle board production started in 1930 and the commercial scale manufacture of particle board began only about seven years ago in the United States where it has progressed so tremendously that today it is a separate major industry. Much of what should be known, therefore, about equipment, processing techniques, etc., has already been found through research, know-how and experience of the industry in advanced countries. What remains to be done by researchers in the Philippines is to develop methods or techniques that would suit native raw materials and local conditions in the manufacture of particle board.

*Sawdust*

The utilization of sawdust is a problem of great magnitude in the Philippines. Except for a very insignificant percentage, which is now used for fuel, for compost, for smoking and for filling material, it has no utility worth mentioning.

In well developed countries like the United States, sawdust is used for:

1. Stable and dog house beddings as substitute for hay.
2. Absorbent in butchers shops and markets.
3. Moistening hides for stretching in leather manufacture.
4. Cleaning, drying and polishing metals. It is effective in removing oil and grease from metal and metal products.
5. Packing of grapes and other fruits, fragile articles, etc.
6. Insulation.
7. Curing of freshly poured concrete.
8. Soil conditioner or improver. It improves soil structure, increases organic content, reduces run-off, prevents baking, and lessens tillage labor.

9. Mulch.
10. Meat and ham smoking during their curing. Hickory sawdust is preferred for this purpose.
11. Filler which is used as raw material for wood flour, stucco, gypsum compositions, abrasives, floor sweeping compounds, plastics, etc.
12. Molded products, such as paper roll plugs, toys, etc.
13. "Mixolit" boards. By the "Mixolit" process, it is possible to make high grade boards out of all kinds of wood wastes, principally damp sawdust, without the addition of binder. This is a relatively new process. It was patented in Europe and the United States of America in 1953 and 1958, respectively.
14. "Presto-log". — Compressed sawdust and shavings under high pressure.

In spite of the various uses of sawdust in the United States, a very large percentage of sawdust is still being wasted, because its utilization is limited by its physical nature, lack of uniformity, handling charges, and transportation costs from points of concentration to factory site.

It is realized that a potential use of sawdust is for fuel of ordinary cooking stoves. The Forest Products Research Institute is now working on a sawdust-fired portable stove of simple design and easy to make. It should be cheap enough for the rural folks and poor families to obtain.

Wood waste in veneer and plywood mills is commonly used for fuel of steam-heated plants. But if more profitable uses for the waste are developed, the operators may use diesel or bunker fuel which might be economical in the long run.

A number of plywood factories in the Philippines installed bolter mills right beside their plants, and saw their bolt cores into lumber for packaging, fencing and for light temporary construction. The International Hardwood and Veneer Company in Manila, the Eastern Plywood Corporation in Pasig, Rizal and the Aguinaldo Development Corporation in Maco, Davao are doing this. The use of the waste for this purpose may be justified, but most operators are still looking for more profitable outlets.

Three by-products which could be made from waste veneer are: woven veneer, plywood floor tiles, and paper-over-laid veneer on which the Forest Products Research Institute has done some studies.

*Woven veneer* is used as screen, room partition and divider, ceiling and decorative design, for basket making, helmets, lampshades, etc. The manufacture of woven veneer does not require additional machinery. The veneer clipper could be used to cut veneer into the desired width of slats for weaving. Before clipping, however, the veneer should be dried to the moisture content that is required in service in order to minimize the occurrence of spaces between slats in the weave. The range of veneer thickness most suitable for weaving is 1/10 to 1/16-inch.

*Plywood floor tiles* is another product that could be made from veneer and plywood waste. The floors of the offices of the Director and Assistant Director of the Forest Products Research Institute are tiled with this product. A study was started at the Institute to determine the suitability of some commercial Philippine woods used in plywood manufacture for plywood floor tiles. Excess and used veneers, after having been used in veneer cutting and drying studies, were made into plywood that is bonded with phenolic and urea resin adhesives, cut into 9-inch square tiles, and installed on concrete floor in the same way as any ordinary method of laying asphalt tiles. The plywood tiles which were installed in the Institute are still under service test, so we can not say yet how good the performance is.

Solid residues are out about 1-foot long and are bound into 4-inch diameter bundles and sold at 5 centavos per bundle.

Slabs, edgings and trimmings not capable of re-manufacture are sold to fuel dealers at 55 to 60 Pesos per trackload.

Bark is stripped from logs and cut to 20 inches long bundled to about 10 inches in diameter and sold at 25 centavos per bundle.

Shavings at the small plower in matcher in sawmills are sometimes fed to the boilers of mills having lumber kilns.

*Paper-overlaid veneer and plywood* is a composite product made of paper (with or without resin impregnation), bonded on each side of a single sheet of veneer or plywood. Paper overlay is used to hide minor defects of veneer and plywood such as face checking and splits, small knots, patches, etc. in order to up-grade low-grade veneer and to increase the yield of plywood from a given supply of logs.

*Weed species*

From the standpoint of silviculture, weed species are those trees that are growing vigorously side by side with and to the disadvantage of trees with commercial value. These trees may be dominant in diameter and height and also in occurrence in the forest, but they have no commercial application, either because of some inherent negative properties or because of prevailing bias against their use, or lack of knowledge of their good features and characteristics.

As stated elsewhere in this paper, there are more than 3,700 species of trees in the Philippines, that have not as yet found commercial application. Some of them may be good for a special type of product. A few of them may be suitable for several uses, while still others may be suitable for some use or another. The FPRI is studying extensively some of the species that might be useful for some purposes, by laboratory tests, which involve their chemical, physical and mechanical properties, and their fiber dimensions and characteristics. It is of interest to know that some of these weed species have their own prospects too, in the veneer and plywood industry and in secondary wood-using industries.

TOOG [*Combretodendron quadrialatum* (Merr.) Merr.] is a good example of a promising weed species for the veneer and plywood industry. It is a tall straight tree, resembles apitong in appearance, and reaches a height of 40 meters and a diameter of 100 centimeters or more. It is found in fairly good stands in Agusan, Masbate and Surigao among the commercial trees in the forest. But for years now, it is not utilized for lumber, because it is cross-grained, hard and heavy, hard to saw and difficult to cut with an axe, likely to split and warp, and unstable. After months of research on toog logs donated by the Lianga Bay Logging Company and the Bislig Bay Lumber Company, the Forest Products Research Institute has found successful treatment before cutting and determined the range of veneer lathe setting variables to produce acceptable quality veneer from this species. Similarly, optimum range of temperature has been determined for successful drying of toog veneer in a mechanical dryer. Premilinary studies at the Institue indicated that gluing of toog veneers presents no problems. Bond strength developed was considered satisfactory using urea-resin glue.

BALOBO (*Diplodiscus paniculatus* Turcz.) is another example of a promising weed species. It is widely distributed in fair quantity throughout the Philippines. The tree is medium-sized, heavy, seasons well and is easy to work on. This wood, however, is very susceptible to stain and mold. One of our research projects indicates that balobo though somewhat heavy for the purpose may be a good wood for venetian blinds. Balobo venetian blinds are now on service test at the lobby of the lobby of the Forest Products Research Institute for more than three years. So far, the performance has been satisfactory. Our next studies on balobo will be on its suitability for bowling pins and bobbins.

BALAKAT [*Ziziphus talanai* (Blanco Merr.] is not exactly a weed species because it is sawed occasionally and marketed as "white miscellaneous" lumber at a low price. It is, rather, a neglected species. Studies are now in progress at the Forest Products Research Institute to find out the suitability of balakat for baseball and softball bats.

(*Continued on page 42*)

# Grain, Texture, Color, and Figure of Philippine Woods

By

BENIGNO A. LOMIBAO

and JUSTO P. ROJO[1]

Wood is a complex material and its properties are greatly influenced by several factors. Some of the properties are inherent in the wood itself; others are the result of milling and manufacturing processes. Some of the properties affect the physical and mechanical characteristics; others affect the appearance. Grain, texture, color, and figure are closely related to the structural, seasoning, shrinkage, and working properties of wood, and ultimately with its commercial utilization and value. Timbers possessing desirable physical and mechanical properties are in demand for construction purposes, while those with suitable working properties and pleasing appearance are required in the manufacture of plywood, in cabinet making and turnery, and for novelties. Woods which are moderately strong, but straight-grained, light in weight, fine-textured, light-colored, tasteless, and odorless are suitable for the production of matches, toothpicks, popsicle sticks, ice cream spoons, and containers, for example. Other times, the aroma in wood is sought after and prized as in the manufacture of cigar boxes and cedar chests. It is clear then, that the effective utilization of wood depends upon the purposes for which the wood is intended, and its properties must therefore be considered in making a wise choice.

*Definitions.* — The terms *grain*, *texture*, and *figure* should not be used interchangeably, for each has a distinct and separate meaning.

1. *Grain* refers to the relative alignment or direction of the wood fibers and other cells in relation to the longitudinal axis of an individual piece of wood, tree, or part of a tree.

2. *Texture* refers to the size, kinds, abundance, and arrangement of the wood elements, and includes the width of the growth rings.

3. *Figure* is the appearance, in terms of pattern or design, produced on a smooth longitudinal surface of wood as a result of the arrangement of the different tissues, the plane of sawing, and the nature of the grain.

## GRAIN

Grain, in its restricted use, is classified into six types, namely:

1. *Straight grain.* — Wood in which the fibers and other cells lie in a direction more or less parallel to the longitudinal axis of the tree, tree part, or board, is said to

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be straight-grained. Straight-grained wood is characterized by the absence of knots and other irregularities. For structural timbers, where strength is a prime consideration, this type of grain is preferable to irregular and spiral grain because of the inherent mechanical weaknesses associated with the latter. Moreover, straight-grained timber is comparatively easy and not wasteful to machine. However, most straight-grained woods, especially those with dull colors, do not give rise to ornamental figure and are therefore not especially valued for cabinetry, parquetry, or the production of fancy veneers. Examples of straight-grained woods are balobo, bansalagin, batikuling, batino, bolong-eta, gubas, and lanete.

2. *Irregular grain.* — Wood in which the fibers are at varying and irregular inclinations to the longitudinal axis of the log is said to have irregular grain. Irregular grain is frequently restricted to certain areas of the tree around knots, and occurs in association with swollen butts and buttresses. Irregular grain results in mechanical defects and seriously reduces strength when excessive; however, it often gives rise to an attractive figure.

3. *Diagonal grain.* — This is the result of improper sawing in straight-grained timber, the fibers being cut at an angle to the longitudinal axis of the board. Such a board is weak in compression parallel to the longitudinal axis of the board.

4. *Spiral grain.* — A condition which results from the coiling of fibers in a tree stem to produce a twisted appearance is called spiral grain. The twist may be left-handed or right-handed, and the inclination of the fibers may vary at different heights in a tree trunk or branch. The cause of spiral grain has not yet been determined. Some researchers believe that it is a hereditary characteristic of individual trees. Such grain induces difficulty in sawing and lowers the strength of timber; it is considered a serious structural defect. In bending strength, there is a reduction of about 4 per cent when the slope of the spiral is 1 in 25, and 7 per cent when the slope of the spiral is 1 in 20.

5. *Interlocked grain.* — This is sloping grain in which the direction of the slope changes in successive layers of wood along the radius of the trunk. Interlocked grain is a characteristic feature of many tropical timbers, and although it does not appreciably affect the strength of timbers, it may cause serious twisting during seasoning. If pronounced, interlocked grain makes the wood difficult to split radially. Woods with interlocked grain are hard to saw because the fibers tend to pull out and wrap themselves around the saw teeth producing a very rough surface. An added disadvantage is that such timbers "pickup," particularly when being planed on the quarter surface, to produce a shaggy finish. On the other hand, interclock-grained boards give rise to a beautiful figure (stripe or ribbon) on quarter-sawn surfaces which is especially pronounced in the Philippine mahogany species.

6. *Wavy (curly) grain.* — When the direction of the fibers is constantly changing, so that a line drawn parallel with them appears as a wavy line on a longitudinal surface, the grain is said to be wavy. Wood with a wavy grain presents a corrugated surface when split. The importance of this type of grain lies in its decorative values, and any reduction in strength is considered insignificant. Wavy grain may occur together with interlocked-grain in a single piece of timber, giving rise to a broken "ripple" on quarter-sawn surfaces, called *roe figure*. Species having wavy-grained woods are banuyo, dao, kalamansanai, malaruhat, malakalumpit and pagsahingin.

Different methods are use to determine the types of grain in wood. One method is to draw a sharply-pointed steel scribe in the direction towards which the grain seems to run. Enough pressure should be ap-

plied to allow the point of the scribe to penetrate the wood, and freedom of lateral movement should be permitted so that the point can follow the grain. Two or more scribed lines should be made to determine the grain direction. If the lines run parallel with each other, the grain is straight. If they intersect and cross each other, the grain is interlocked; if the lines run in a diagonal or a wavy direction, the grain is diagonal or wavy, respectively. Other methods, such as free flowing ink and splitting, are also used. The latter method is the most practical way of determining the type of grain in wood. Splitting is accomplished by extracting a conveniently sized sample 7.5 x 7.5 x 15 cm. (about 3 x 3 x 6 in.) from the wood to be tested, and cleaving it longitudinally with a chisel, axe, or wedge. In the case of interlocked-grain, the opening produced across the rings cannot follow the various planes of intertwining fibers, and the fibers are cut or torn. Growth rings and the direction of seasoning checks in the timber are also indicators of the type of grain, but these are not as reliable as the splitting and scribe methods.

## TEXTURE

The term *texture* must be preceded by qualifying adjectives in order to define its nature. Such expressions as very fine, fine, moderately coarse, coarse, even texture and uneven texture, are frequently encountered in descriptions of wood.

*Very fine texture.* — Woods in which the cells are so small as to be indistinguishable to the naked eye are said to be of very fine texture. Under this group are agogoi, almaciga, itangan, kamagong, katilma, lanete, mamalis, mangkono, molave, tamayuan, and other species with similar characteristics. When the vessels and other cells are small, and can just barely be seen with the naked eye, the wood is of *fine texture*. Some of the common commercial species belonging to this group include dalindiñgan, guijo, malapapaya, malugai, miau and yakal-sapluñgan.

*Moderately course.*—The wood elements of this group are medium-sized and are visible to the naked eye without strain. A few examples are almon, bagtikan, dao, ipil, manggasinoro, mayapis, narra, raintree and tindalo.

*Coarse texture.*—This refers to woods in which the elements are large enough to be readily and distinctly visible to the naked eye. Antipolo, anubing, apitong, dangkalan, lanipau, manaring, rarang and red lauan and others are classified in this group.

*Even-texture.*—In diffuse-porous hardwoods where there is little variation in cell size within growth rings, or in hardwoods which lack growth rings, the texture is described as even. This term also applies to softwoods where there are no growth rings, or where the growth rings are not composed of hard (late wood) and soft (early wood) segments.

*Uneven texture.*—Ring-porous hardwoods are generally uneven-textured as are softwoods in which there are sharply defined hard and soft portions in the growth rings. Ring-porous hardwoods which are uneven-textured include banaba, batitinan, kalantas and narra.

Texture in wood may be determined with the naked eye, hand lens, and by microscopic means. It is not complicated but needs accuracy because controversies may arise where one species is classified under two types of texture; keen judgment is necessary to avoid misgrouping of the species.

Fine-textured, straight-grained woods are suitable for turned articles, novelties, and sporting goods; on the other hand, coarse-textured, irregular-grained woods may not result in high-quality products. Because of this, fine-textured woods such as kamagong, molave, and sangilo are suitable for gavels; ebony, karuksan, and lanete are good for inlayed products; and alupag, bansalagin, ebony, malatapai, and tamayuan are used for bobbins, spindles, and shuttles.

## COLOR

Philippine woods exhibit various colors ranging from jet black in ebony, to red in red narra; white in gubas, lanete and white nato; and variegated colors in anang, anang-gulod, dao, and pahutan. However, wood finishers and some wood users stain wood in a great variety of ways to achieve other color effects.

Variation of color in wood is largely caused by the different kinds of infiltrates in the cell wall, as minerals, gums, tannins, and resins. Some of these infiltrates undergo changes when exposed to light, heat, or air, and woods may change color intensity from light to dark. Mahogany, which fades under strong sunlight, darkens in moderate light. Some wood users resort to kiln-drying to alter the color from light to dark; others lime or bleach the wood with hydrogen peroxide to whiten the wood, while still others use ammonia gas to achieve a dark-colored effect. To the wood-using industry, especially makers of furniture, cabinets, and novelties, color considerably enhances beauty and affects the price of the finished products.

## FIGURE

Figure, as mentioned above, is defined as the general pattern or design produced on a smooth longitudinal surface of the wood. It may be caused by irregularities of grain, arrangement of soft tissues, large rays, growth rings, or a combination of any of these features. The plane or manner of sawing or cutting may also contribute to the formation of figure in wood.

Studies conducted on some Philippine woods reveal the presence of the following figures:

1. *Figure due to natural arrangement of the wood elements*—This kind of figure occurs in plain and quarter-sawn[2] boards and is influenced by certain special features such as:

   a. *Bands of soft tissues.*—These are parenchymatous tissues running parallel to the growth rings as viewed on a transverse section. Banaba, miau, and malakalumpit exhibit this feature.

   b. *Soft tissues surrounding the vessel.*—These are distinctive markings which appear on the longitudinal surface of the wood owing to the presence of wide sheaths of soft tissues surrounding the vessels. On flat longitudinal surfaces, markings which result from these tissues appear to be white and very distinct from the darker color of the surrounding wood. Species which show this type of figure are anubing, kamatog, malakalumpang, narra, and rarang.

   c. *Ripple marks.*—These are fine markings found on the back-cut (plain sawn) surfaces of some woods. Sometimes ripple marks produce a fine regular figure if sufficiently distinct. Ripple marks are caused by the storied arrangement of the wood rays and other elements. Bayok and narra reveal this feature.

   d. *Color.*—As already mentioned earlier, variation in the color of wood is influenced by irregular deposits of coloring matter in the wood cells. These irregular deposits give rise to the formation of streaks, dots, and stripes of various shades. Black strips, for example, are found in the woods of anang, anang-gulod, and dao; reddish to purple stripes occur in afu, dagang, palosapis, and uas.

   e. *Flaky or silver figure.*—This figure appears on quarter-sawn boards in species which have broad wood

[2] *Plain-sawn.*—Boards sawn parallel to the pith of the logs and approximately perpendicular to the wood rays so that the wide surface forms an angle of 45 degrees or more with wood rays. *Quarter-sawn.*—Boards sawn parallel to the pith of the logs and more or less parallel to the wood rays such that the wide surface of the board forms an angle of 45 degrees or less with the wood rays.

rays. Kalimatas, katmon, *Lithocarpus* spp., mabunot, and malakatmon typify this figure.

2. *Figure caused by grain variations and irregularities.*—Interlocked and wavy grain greatly influence the figure in wood and give luster to the timber. *Luster* refers to the manner or degree in which light is reflected from the wood elements and their contents, and is responsible for changeable effects obtained in certain types of figure, namely:

a. *Fiddle back.*—Wavy-grained logs when quarter sawn give rise to a series of fine and regular alternating dark and light stripes across a piece of board brought about by the reflection of light by the individual elements which are cut at varying angles.

b. *Raindrops.*—This figure is produced when waves in the fibers occur either singly or in groups in short intermittent lustrous streaks across the width of a board. Samples of pianga were observed to exhibit this figure, however, it does not appear to be a species characteristic.

c. *Mottle.*—This appears as irregular lustrous waves extending for short distances across the quarter-sawn surface. Samples of apanit, himbaba-o, lamog, liusin, and Pará rubber were observed to show this figure.

d. *Ribbon figure.*—This is caused by alternating longitudinal stripes found in quarter-sawn timber which possesses interlocked grain. Stripes are caused by the varying inclinations of the wood elements in successive layers. Ribbon figure appears in continuous stripes, but some cases, it occurs in short broken stripes producing *roe figure.* The beauty of ribbon figure results from the changes in lustrous effects obtained when the surface of the wood is viewed at varying angles with respect to the source of light. Philippine mahogany species and other commercial species with interlocked grain possess this figure.

3. *Figure caused by irregularities in the tree.*—Figure resulting from the natural irregularities in the tree is dependent upon the presence of knots, burls, crotches, buttresses, dormant buds, and other variations. These irregularities are properties of each tree, rather than being a species characteristic. They may be more common in one tree than in others of the same species. Sometimes they are caused by injury to the tree trunk; some burls fall into this category. Burls are abnormal growths or excrescences formed by local development of numerous dormant buds and a massive interweaving of wood elements. Beautiful figure is obtained if these irregularities are large and distinct and if the wood is quarter-sawn. Knots are very common in tree trunks where branches were formed. If large and distinct, knots cause the wood elements around them to wrinkle thus altering the direction of the wood elements in the area. Boards with knots show a certain luster owing to variations in the angle of light reflection. Anubing, bagarbas, bitanghol, margapali and molave show decorative figure around knots if they are large in size. However, if they are of small size, no special figure may be produced. Crotches are irregularities common at the origin of branches or near a root at the buttressed base of a tree. As a result of the folding or wrinkling of the wood elements in these places, attractive figure is sometimes produced. Acacia, molave and narra were found especially notable in the production of elaborate crotch-induced figure.

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## APPENDIX A

*List of species mentioned in the text*

| *Species* | *Scientific name* | *Family* |
|---|---|---|
| A. *GRAIN* | | |
| a) *Straight-grain* | | |
| 1) Balobo | *Diplodiscus paniculatus* Turcz. | Tiliaceae |
| 2) Bansalagin | *Mimusops parvifolia* R. Br. | Sapotaceae |
| 3) Batino | *Alstonia macrophylla* Wall. ex DC. | Apocynaceae |
| 4) Botong-eta | *Diospyros pilosanthera* Blanco | Ebenaceae |
| 5) Lanete | *Wrightia laniti* (Blco.) Merr. | Apocynaceae |
| b) *Interlocked grain* Philippine mahogany species. | | |
| 1) Almon | *Shorea almon* Foxw. | Dipterocarpaceae |
| 2) Bagtikan | *Parashorea plicata* Brandis | " |
| 3) Mayapis | *Shorea squamata* (Turcz.) Dyer | " |
| 4) Red lauan | *Shorea negrosensis* Foxw. | " |
| 5) Tangile | *Shorea polysperma* (Blco.) Merr. | " |
| 6) Tiaong | *Shorea* sp. | " |
| 7) White lauan | *Pentacme contorta* (Vid.) Merr. & Rolfe | " |
| c) *Wavy (curly) grain* | | |
| 1) Banuyo | *Wallaceodendron celebicum* Koord. | Leguminosae |
| 2) Dao | *Dracontomelon dao* (Blco.) Merr. & Rolfe | Anacardiaceae |
| 3) Kalamansanai | *Neonauclea calycina* (Bartl.) Merr. | Rubiaceae |
| 4) Malakalumpit | *Terminalia calamansanai* (Blco.) Merr. | Combretaceae |
| 5) Malaruhat | *Cleistocalyx operculatus* (Roxb.) Merr. & Perry | Myrtaceae |
| 6) Pagsahiñgin | *Canarium asperum* Benth. | Burseraceae |
| B. *TEXTURE* | | |
| a) *Very fine* | | |
| 1) Agogoi | *Chisocheton tetrapetalus* (Turcz.) C. DC. | Meliaceae |
| 2) Almaciga | *Agathis philippinensis* Warb. | Araucariaceae |
| 3) Itangan | *Weinmannia luzoniensis* Vid. | Cunoniaceae |
| 4) Kamagong | *Diospyros philippensis* (Desr.) Guerke | Ebenaceae |
| 5) Katilma | *Diospyros nitida* Merr. | " |
| 6) Lanete | *Wrightia laniti* (Blco.) Merr. | Apocynaceae |
| 7) Mamalis | *Pittosporum pentandrum* (Blco.) Merr. | Pittosporaceae |
| 8) Molave | *Vitex parviflora* Juss. | Verbenaceae |
| 9) Tamayuan | *Strombosia philippinensis* (Baill.) Rolfe | Olacaceae |

| *Species* | *Scientific name* | *Family* |
|---|---|---|
| b) *Fine* | | |
| 1) Dalingdingan | *Hopea foxworthyi* Elm. | Dipterocarpaceae |
| 2) Guijo | *Shorea guiso* (Blco.) Blume | " |
| 3) Malapapaya | *Polyscias nodusa* (Blume) Seem. | Araliaceae |
| 4) Malugai | *Pometia pinnata* Forst. | Sapindaceae |
| 5) Miau | *Dysoxylum euphlebium* Merr. | Meliaceae |
| 6) Yakal-sapluñgan | *Hopea plagata* (Blco.) Vid. | Dipterocarpaceae |
| c) *Moderately coarse* | | |
| 1) Almon | *Shorea almon* Foxw. | Dipterocarpaceae |
| 2) Bagtikan | *Parashorea plicata* Brandis | " |
| 3) Dao | *Dracontomelon dao* (Blco.) Merr. & Rolfe | Anacardiaceae |
| 4) Ipil | *Intsia bijuga* (Colebr.) O. Ktze. | Leguminosae |
| 5) Manggasinoro | *Shorea philippinensis* Brandis | Dipterocarpaceae |
| 6) Mayapis | *Shorea squamata* (Turcz.) Dyer | Dipterocarpaceae |
| 7) Narra | *Pterocarpus indicus* Willd. | Leguminosae |
| 8) Raintree | *Samanea saman* (Jacq.) Merr. | " |
| 9) Tindalo | *Afzelia rhomboidea* (Blco.) Vid. | " |
| d) *Coarse* | | |
| 1) Antipolo | *Artocarpus blancoi* (Elm.) Merr. | Moraceae |
| 2) Anubing | *Artocarpus ovata* Blco. | " |
| 3) Apitong | *Dipterocarpus grandiflorus* Blco. | Dipterocarpaceae |
| 4) Dangkalan | *Calophyllum obliquinervium* Merr. | Guttiferae |
| 5) Lanipau | *Terminalia copelandii* Elm. | Combretaceae |
| 6) Manaring | *Lithocarpus soleriana* (Vid.) Rehd. | Fagaceae |
| 7) Rarang | *Erythrina subumbrans* (Hassk.) Merr. | Leguminosae |
| 8) Red lauan | *Shorea negrosensis* Foxw. | Dipterocarpaceae |
| e) *Uneven* | | |
| 1) Banaba | *Lagerstroemia speciosa* (L.) Pers. | Lythraceae |
| 2) Batitinan | *Lagerstroemia piriformis* Koehne | " |
| 3) Kalantas | *Toona calantas* Merr. & Rolfe | Meliaceae |
| 4) Narra | *Pterocarpus indicus* Willd. | Leguminosae |

C. *FIGURE*

1) *Figure due to natural arrangement of the wood elements.*

| | | |
|---|---|---|
| a) *Bands of soft tissue* | | |
| 1) Banaba | *Lagerstroemia speciosa* (L.) Pers. | Lythraceae |
| 2) Malakalumpit | *Terminalia calamansanai* (Blco.) Merr. | Combretaceae |
| 3) Miau | *Dysoxylum euphlebium* Merr. | Meliaceae |
| b) *Soft tissues surrounding the vessel* | | |
| 1) Anubing | *Artocarpus ovata* Blco. | Moraceae |
| 2) Kamatog | *Erythrophloeum densiflorum* (Elm.) Merr. | Leguminosae |

(*Continued on page* 50)

# Research and Wood Promotion Program:

## Solutions to Problems of the Wood Using Industries*

by

DOMINGO M. LANTICAN
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Wood has served man through the various stages of civilization. It was a big factor in the development of agriculture, mining, navigation, the railroad and telecommunication. For centuries it has played the undisputed role of primary material for construction of homes and buildings. Furniture and other household items were exclusively made of wood. Bridges were once almost entirely wood and roads were paved with wooden blocks. Even today's modern edifices of steel and concrete take shape in wooden forms. Among the earliest industries were those using wood as raw material. At present the uses of wood are so numerous that it will be difficult to enumerate them individually.

With the rapid progress in technology, more and more products are being developed today which threaten to displace many of the uses of wood. Among the first countries to feel this problem is the United States, a highly industrialized country where substitute materials are comparatively cheap and plentiful. How long wood will hold out depends on the measures that the wood industries are now taking to cope with the problem.

In the Philippines a similar situation exists to a certain extent but not in complete parallelism. The real problem obtaining in this country is the apathy and neglect that the wood industries are now suffering. Hampered by the lack of capital, technical skill and high quality requirement of the export market, these industries have hardboards and insulating boards are expractically remained static for many years.

Regardless of the difference in the nature of the problems faced by the wood industries anywhere in the world, a greater part of the solution lies on two basic remedial measures: sales promotion and research. The situation in the United States may very well serve as a pattern in solving the many ills that plague the wood industries today.

The forest industries of the United States are among the oldest, starting as far back as 1608 in the state of Virginia. Today these industries rank as the fifth largest industry next only to steel, petroleum, automobile and chemicals. Among the wood industries the lumber industry is the largest employing about a quarter of a million people. It uses about one-half of the total timber cut and produces a yearly average of 30 to 40 billion board feet.

A study of the forest industries of the United States will show that it is at a high stage of development today, characterized by high volume of production, efficiency and diversification.

The progress of the wood industries in the United States is attributable to the heavy consumption of wood products. The present per capita consumption averages 300 board feet annually which is among the worlds highest.

The United States lumber industry is expected to expand within the next 20 years. Although a slight drop in the per capita

* This paper was read at the College of Forestry Faculty Seminar on December 18, 1963.

consumption of wood is foreseen the production of lumber and the per capita requirement for pulp and paper products, pected to increase. The demand for veneer and plywood is likewise predicted to go up.

In spite of the bright future, the wood using industries, particularly that of lumber, are beset by various problems that pose a threat to their existence. The depletion of the mature virgin timber is forcing the industries to depend more and more on smaller second growth material for its supply. As a result, stumpage and manufacturing cost are increasing and lumber size and quality are declining. More wood residues need to be converted into useful products. The need for technical skill in processing is becoming more pressing.

The increase in the price of lumber is encouraging the use of substitute products. During the last twenty years, the increase in the price of lumber has outpaced the increase in cost of competing materials such as aluminum, iron, nickel and copper. Within ten years the production of plastic packaging has more than trebled competing heavily with wood.

The wood manufacturer has a disadvantage in comparison with other producers in that he has one basic raw material. His factory and the major part of his equipment is designed for wood processing leaving him no choice in the raw material that he uses and the products that he may turn out. This limits the solutions to his business problems.

The counter measures adopted by the wood using industries revolve around sales promotion, product development through research, the utilization of new design and engineering skills and the employment of highly trained wood technologists.

A good example of solving the problems is the approach made by the National Lumber Producers Association through the National Wood Promotion Program which has the following objectives: (a) to familiarize student architects and engineers with the tural and finish material and (b) to enuses of lumber and wood products as struccourage high school students to seek technical careers in the wood products industry.

To meet these aims, the association engages in the extensive distribution of literature on wood to students and libraries. It conducts seminars and lectures on properties, grading, wood engineering, glue laminated construction, fastenings, specifications and building codes. It cooperates with other agencies such as the Forest Products Research Society and the state forestry extension services.

The government, aware of the importance of the forest resources and the role that the wood using industries play in the national economy, helps in promoting the use of wood. Aside from the efforts of the United States Forest Service to help the industry in the form of research and extension program, the president of the United States, each year since 1960, declare a National Forest Products Week. This aids in bringing about public consciousness in the importance of wood and the forest resources.

The wood using industries of the United States spend a great deal of money on research which includes product design, development, technology and, to a certain extent, basic research. In 1953, $27,000,000 was spent by the industries and $4,000,000 by public agencies on research. By 1960 these have risen to $60,000,000 and $5,600,000 for industries and public agencies respectively. The biggest percentage of these amounts was born by pulp, paper and fiber research and the remainder was spent by the other industries. In 1958 pulp and paper entities spent $90 per cent employee on research while the lumber industries spent about $22 per employee. The low value for research per employee in the lumber industries stems from the fact that many of the wood using industries are small and comparatively few can afford to maintain research laboratories of their own. This function has been

taken over by the forest Products Laboratory at Madison, Wisconsin which is maintained by the federal government.

How research on wood can be a major factor in solving many of the problems of the wood industries is shown by the various wood items that have been developed through the years. During the Second World War the demand for wood products including housing, gunstocks, training planes, ships, boxes, crates, wraps and other war items gave an impetus on studies on wood to meet the war requirement. Out of these efforts came the development of stressed-skin plywood, torpedo boats, landing crafts, boat hulls, glued laminated frames, pre-fabricated barracks, laminated arch hangars, drill halls and factories. Most of these products found their way in the commercial market in the form of pre-fabricated housing, boats, stressed-skin structures, laminated structural parts for homes, school-houses and churches and many household articles.

New technologies, born of research, brought about the closer utilization of the timber resources. Slabs and edgings are now used for pulp. The development of semi-chemical and cold soda process brought about higher pulp yield. More hardwood species are now being used for pulp. Better cutting methods, seasoning and preservation techniques promoted the use of weed species. Progress in resin adhesive technology gave rise to higher quality plywood, laminated beams and arches, particle boards and other glued products.

Standardization gave rise to finished and ready to install products such as pre-assembled windows, doors, wardrobes, panelized floors, walls, roofs and pre-finished sidings.

Production efficiency as a result of studies are exemplified by the automation in manufacturing, continuous pulping process, mechanized felling, bucking and delimbing.

The development and present situation of the forest industries of the United States and the effort that is being done to retain the wood market, as has been previously discussed, point out some of the methods which may be adopted in the Philippines to solve our own problems.

The situation is the Philippines is far more discouraging in the sense that it has yet to develop its domestic and foreign market. The local industries have had a very sluggish postwar development. What progress there is has been confined to plywood manufacture. Very few companies have gone to remanufacturing. Except for some small furniture plants, very few concerns are turning out wood products in quantities. In general, the wood industries, particularly the lumber industry, has been stagnant for almost 20 years if not longer.

Although the forest industries, as a whole, is now the third biggest dollar earner of the country, the bulk of our export is in the form of raw timber and very little is contributed by plywood, lumber and other wood products. Whereas the timber export has increased from 19 million board feet in 1949 to about 2 billion board feet in 1962, or an increase of about a hundred times, the lumber output has been oscillating at an average of half a billion board feet with hardly any production growth.

The timber export boom has left the lumber industry neglected. The best timber are shipped out of the country leaving the relatively poorer logs for the domestic lumber and plywood producers. The best plywood and a small percentage of high quality lumber are exported. The home market absorbs the poorer quality plywood and the surplus and unexportable grade lumber from the better mills plus whatever lumber that may be supplied by the smaller, ill equipped mills that have to rely on maximum production with the least production cost in order to survive. The average consumer uses ungraded, unseasoned and improperly machined lumber. Better quality lumber and plywood are scarcities. Under

the situation, it is not difficult to understand the poor state of the lumber market in the Philippines.

The local lumber market, in general, is indifferent and is almost at the complete mercy of the wood producers. The per capita annual consumption today is about 12 board feet which is very low as compared to about 300 board feet in the United States. While lumber production since 1949 has remained practically the same and with the population continuously increasing, this would seem that our per capita consumption is decreasing. This is not true however, since our lumber export has dropped from a peak of 80 million board feet in 1951 to only 39 million board feet in 1962. The difference has been channelled to the domestic market which means an increase in local consumption of about 41 million board feet after a lapse of about 10 years.

There is a need for the development of the home market if our wood industries, particularly the lumber industry, are to survive. With increasing cost of wood products but without a definite program to improve the quality, these commodities might lose the prestige that it now hold as a primary construction material and as industrial raw material and gradually give way to substitute materials like metals, concrete and plastics.

The processing of logs both for export and domestic needs cannot remain neglected forever. With the depletion of logs of exportable quality, some of our timber producer must inevitably close down and those who decide to remain in the business must necessarily go into primary conversion and remanufacturing. This will not be easy since the transition will demand investment on equipment, highly trained technical men, stringent quality control, product development and sales promotion. These problems are the reasons for the timidity of the local forest industries to turn from the more lucrative timber export business to wood processing.

The need for forest products research in the Philippines is of prime importance. The properties of many of our local species have not yet been determined and many uses for some of these woods are not yet found. Studies on seasoning, wood preservation, machining qualities and production techniques are wide open fields. The potentialities of our native trees for pulp and paper manufacture are practically unknown.

Research is a very expensive and long time proposition requiring not only skill but tedious and careful observation. For these reasons, many of the wood using industries will find difficulty finding qualified men and maintaining research laboratories of their own. Aware of this facts, the government has established the Forest Products Research Institute which has among its functions, aside from conducting research, the extending of technical assistance to the wood using industries. In this laboratory are gathered highly trained men and with scientific facilities for wood research. It is the only place in the country where extensive studies on wood and wood products are being conducted and a great deal of information of this field is made available to the industries.

The College of Forestry, University of the Philippines will be of valuable help in the development of the wood using industries in two important ways: the training of technical men to fill the needs of the forestry government agencies as well as of private industries and the dissemination of forestry information with the aim of conserving the forest resources and the promotion of the use of wood.

The curricula of the college are designed to develop and train men so that they may acquire competence in the management of the forest resources, logging engineering and wood products utilization. Since a necessary balance between forest and agriculture must have to be maintained,

(*Continued on page* 42)

# Tapping and Collection of Almaciga Resin in Palawan and Camarines Provinces

*By*

F. R. LOPEZ, L.L. REBUGIO and
M. L. MAGSANOC[1]

The Forest Products Research Institute recently completed a survey of the tapping and collection practices of almaciga (*Agathis philippinensis* Warb.) resin in the provinces of Palawan and Camarines Norte. The objective of the survey was to gather information that might help the Institute in developing methods aimed at improving the production and quality of almaciga resin.

The survey disclosed that the methods employed by some licensees leave much to be desired. For example, in the municipalities of Aborlan and Brooke's Point, Palawan, only one out of the four tapping sites inspected had adopted the scientific methods prescribed by the Bureau of Forestry. Interviews with 17 licensees indicated that only 7 of them were following Bureau of Forestry recommendations. The other licensees have been employing methods that are crude and violative of practically all the tapping regulations set forth by the Bureau.

Briefly, the unscientific methods that were noted consisted of the following:

1. Over-tapping of almaciga appears to be the rule rather than the exception in some concessions. Some trees have oversized cuts, while others have too many cuts (fig. 1). Bureau of Forestry regulations require that the spaces between tappings should be twice the width of the tapped areas. Violations of this requirement result in physical impairment to the tree.

2. Indiscriminate tapping and carelessly made freshening cuts also contravene standard procedures. In most instances, the tapping was excessively deep and extended to the sapwood. This malpractice destroys the vascular cambium, a tissue which lies between the wood and bark, which is responsible for continued radial growth of the tree and the healing of wounds.

Good harvesting procedures require that resin collection be restricted to two-week intervals in order to allow for the accumulation of large, easily removed amounts of hardened resin. Resin collection at more frequent intervals necessitates scraping the exudate with a bolo in order to remove the incompletely formed, soft, stringy, thin exudate (fig. 2). This was a common practice in some of the concessions and resulted in serious damage to the cambium and underlying sapwood. Cambial damage retards healing and the exposed sapwood serves as an avenue of attack for wood-

[1] Senior Forest Products Technologist, Jr. Forest Products Technologist and Jr. Forest Products Technologist respectively, Forest Products Research Institute, College, Laguna.

destroying agents such as termites and fungi. Severe infestation of termites or severe attack by fungi certainly decreases resin production and the subsequent damage that often results in the death of trees. Also, it has been noted that trees structurally weakened by deterioration are prone to windthrow.

Many of the crudely tapped trees were able to regenerate their bark and wood, but the callus (newly regenerated, thickened tissue) formed is abnormally irregular. Swollen and gall-like protuberances usually develop over the callused areas rendering the regenerated bark unsuitable for future tapping.

3. Resin which has been allowed sufficient time to accumulate and harden normally forms lumps or slabs on the tree trunk which are conveniently chipped off relatively free from bits of bark, wood, and other foreign matter (figs. 3 & 4A). When harvested at too frequent intervals, the resin cannot form large slabs nor can it harden. Removal of thin layers of resin cannot be accomplished without also removing fragments of bark and wood. This results in the production of a low-grade contaminated product which commands a very low market price (fig. 4B).

In Camarines Norte, only two licensees are in active operation. Tapping and collection methods in one of the concessions inspected was exceedingly crude; more primitive even than the methods observed in some parts of Palawan. Great slices of bark were indiscriminately removed baring portions of the sapwood and virtually girdling the trees. These practices will undoubtedly result in the eventual death of the trees; the cambium has been destroyed; food transport through the inner bark has been interrupted; the bark has no chance to regenerate (fig. 5). Furthermore, the unhealed, exposed sapwood, will predispose the trees to attack by termites and wood-destroying fungi.

It is relevant at this point to mention one of the factors, cited by tappers and licensees alike, that contributes to the above-mentioned malpractices of tappers. Thievery of tapped resin by tappers as well as non-tappers is reportedly prevalent among competing concessions, and sometimes even within a concession. Naturally, the poor tapper loses interest in adopting standard procedures for tapping because he is not assured of the fruits of his labor. To remedy this, it is, therefore, imperative that the licensee or his agent exercises close and rigid supervision over his tappers. This also calls for instilling discipline among tappers as well as cooperation among licensees. Some licensees, particularly those in Brooke's Point, Palawan, have succeeded in solving this problem by requiring their tappers to execute an "Authorization-Agreement for Collecting Almaciga" (Appendix A) prescribing a set of rules or orders to be strictly complied with by the tapper. This agreement is supplemented by verbal instructions to the tappers requiring them to follow rigidly the standard tapping procedures set forth by the Bureau of Forestry. These are: (a) Initial tappings should be made on the basal portion of the trunk not more than 30 centimeters above the ground; the width of the cut should be one to two centimeters vertically; and the cut should be 30 centimeters around the circumference. As many tapping cuts as possible around the circumference of the tree may be made, but it is important that spaces between simultaneous tappings should be twice the width of the tapped area. (b) Subsequent tappings should be 4 to 10 millimeters wide immediately above the initial tappings. (c) Cuts should never reach the cambium. The resin is exuded by the bark, not by the wood, so that cutting into the wood will only injure and impair the health of the tree.

In the light of these findings, it is strongly recommended that rigid imple-

(*Continued on page* 74)

Fig. 1. Very wide slanting cuts at the opposite sides of the trunk which occupied more than half of the girth of the tree. Note swollen and fall-like protuberances that developed over the callused area.

Fig. 2. Another improperly tapped tree. Note incompletely formed soft, stingy, thin exudate. The exudations were barely a week old. The callus formed is abnormally irregular.

Fig. 3. A scientifically tapped tree (160 cm. d.b.h.) showing 3-week old resin accumulations in the form of lumps or slabs. High-grade resin free from bits of bark, wood and other foreign materials is produced by this method.

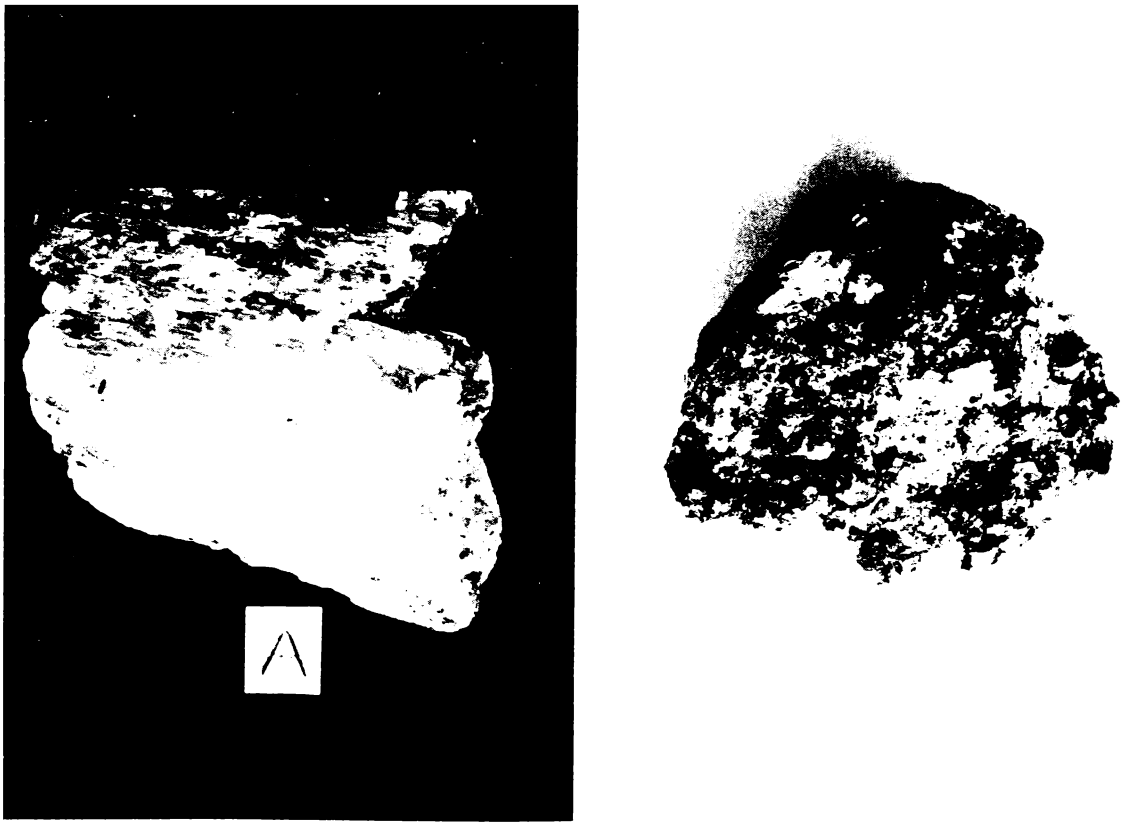


Fig. 4. (A) Slab of high-grade clean resin, (B) low-grade contaminated resin which commands a very low market price.

Fig. 5 An exceedingly primitive method of tapping. Large slices of bark were indiscriminately removed exposing the underlying sapwood and virtually girdling the tree.

APPENDIX A

## AUTHORIZATION-AGREEMENT FOR COLLECTING ALMACIGA

....., 19....

TO WHOM IT MAY CONCERN:

This is to certify that I hereby authorize

.....

to care for almaciga trees and to collect the copal from the almaciga trees located at ..... for me under my OMP License No. ..... until June 30, 19...., for the area between ..... river and ..... river ..... river on the east coast of the Municipal District of .....

Unless terminated earlier this authorization expires June 30, 19.....

### ALMACIGA LICENSEE

In accepting the above authorization I hereby pledge myself to do the following orders and such other orders as the Licensee or his duly authorized agent, shall require me to do in connection with the above authorization.

1. I shall follow the instruction given by the Licensee on how to care for the almaciga trees so that they will be productive and so that clean almaciga can be gathered.
2. I shall not injure the almaciga trees nor allow other persons to do so.
3. I shall not gather almaciga from trees other than those assigned to me. Neither will I allow people to steal almaciga without reporting to the Licensee or his agent.
4. I shall deliver the almaciga to ....

   ..... or only to persons who have the proper authorization from the Licensee.
5. I shall report persons carrying almaciga who do not have the proper authorization.

Failure on my part to follow the regulation of the Licensee for handling almaciga will be considered sufficient cause for the cancellation of the above authorization.

Witnesses:

1. .....

2. .....

.....
Almaciga Collector

I surrender this authorization on .....

....., 19..... In so doing I realize that I am deprived of all the privileges formerly granted to me under the authorization.

.....
Almaciga Collector

## THE UTILIZATION OF WEED . . .

(*Continued from page* 26)

In our study of native woods, several other weed species show promise for the manufacture of various products. Lanutan-bagyo [*Gonystylus macrophyllus* (Miq.) Airy Shaw], malabulak [Salmalia malabariea (D.C.) Schott & End] and anongo (*Turpinia ovalifolia* Elm.) were found to be suitable for venetian blind slats; malakape [*Canthium dicoccum* (Gaertn.) Merr.], bolon [*Alphonsea arborea* (Blanco) Merr.] and taiñgang-babui [*Gonocaryum calleryanum* (Baill.) Becc.] for bobbins; bolon for baseball bats; magabuyo (*Celtis luzonica* Warb.), malaikmo (*Celtis philippensis* Blanco) and hangilo (*Michelia playtyphylia* Merr.) for bowling pins; binggas [*Terminalia citrina* (Gaertn.) Roxb.], agoho (*Casuarina equisetifolia* L.), ulaian [*Lithocarpus llanosii* (A. DC.) Rehd.] and *Diospyros* species for tool handles; agoho, malabayabas *Tristania decorticata* Merr.) and dañgula (sasalit) [*Teijsmanniodendron aherianum* (Merr.) Bakh.] for picker sticks; and binggas, ulaian and tamayuan [*Strombosia philippinensis* (Baill.) Rolfe] for shuttles.

(*Continued on page* 74)

## RESEARCH AND WOOD . . .

(*Continued from page* 38)

careful management of the remaining forest lands is necessary for it to serve as a continuous source of raw materials for the forest products industries. Only men with a solid forestry background can handle this job. Hand in hand with this must come efficient logging procedure satisfying not only the output requirement of the industry but the demand of forest management.

As the supply of timber of better size and quality gets less and less, the conversion of timber into usable products will become more exacting requiring greater technical skill. The college can supply the industry with production men with sufficient background knowledge of wood properties and wood processing. These men are trained to recognize the industrial applications of the basic properties of wood and to use this knowledge in the solution of production problems.

The Forest Extension Department of the College of Forestry is trying to promote public consciousness on the importance of forest and forest products and has started a program towards this end. This department works closely with other government agencies and can give information or make referrals with regard to problems of the forest industries. It also disseminate information on forest and forest uses through the various communication media including the newspaper and radio.

The Bureau of Forestry and the Reforestation Administration of the government will be of help in assuring a permanent supply of raw material for the industries. However, there is a need for close cooperation of the part of the industries for this to be realized.

The economy of the Philippines is basically agricultural and will continue to remain so for sometime. However, industrialization is a necessity to the economy and is steadily coming into the national scene. As the Philippines continue to industrialize the demand for wood and wood products will increase. The wood industries must be able to meet this demand and it can only do so by shifting from purely timber production into wood processing. There are problems that must have to be overcome as has been discussed. A concerted effort on the part of the government and the producers toward a wood promotion program and stepped up wood products research will greatly help in solving some of these difficulties. This is a necessary step to revitalize the wood using industries and to afford maximum utilization of our forest resources.

# *The Role of Cytological Characters in the Solution of Some Basic Problems in Plant Taxonomy*[1]

By

BERNARDO C. SINUES[2]

*Introduction*

An extensive survey of research findings in current literature showed that cytological characters are unknowingly of paramount importance in unraveling the secrets of some plant species that are taxonomically problemmatical.

Taxonomic problems such as those involved in the classification of plants belonging to the lower ranks are very difficult to resolve because the classification system is based primarly on sexual and asexual characters that are morphologically observable. This is likely encountered when varieties or hybrids are dealt with, since they exhibit distinct similarities or only slight differences in nearly all aspects of their gross morphology. In most cases, the uninformed taxonomist is puzzled and helpless in his research as he unscrupulously misplaces plants into the wrong taxonomic rank. However, the more modern investigators in the field of taxonomy can clarify the problem through the application of his more advanced knowledge of cytology, genetics, and other related sciences.

This report brings out some cytotaxonomic developments which are tangible and of scientific value to students in dendrology and other related fields in forestry. Cellular structures, both nuclear and extra-nuclear, are discussed and correlated with the aim of solving some fundamental but perplexing problems in plant taxonomy.

*Discussion*

In the study of cytology, the functional and structural organization of the protoplasm is dealt with; whereas in taxonomy, the classification and naming of plants is studied. Within this premise, the problem of plant classification which involves the placement of plants or group of plants in sequence conforming with a nomenclatural system is a difficult task. Marked disagreements confront various workers regarding the classification of a certain group to its appropriate rank: a variety to a species, a species to a genus, a genus to a family, a family to an order, an order to a class, and so on up to the highest category of the classification scheme. Therefore, to arrive at an accurate and satisfactory classification system, conclusions must be derived from hereditary characteristics exhibited by stable cytological features such as the chromosome. In this respect, its number and morphology are considered of diagnostic value in taxonomic interpretation and evaluation. Other structures such as the nucleolus, chloroplast, and ergastic substances are also of real importance in clarifying species complexes and are therefore included in this paper.

[1] Revised text of a paper submitted in partial fulfillment of the requirements for the degree of Master of Science in Plant Genetics, U.P. College of Agriculture, College, Laguna.

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*Chromosome number.* The principle underlying the usefulness of chromosome number in resolving plant relationships is the fact that it is constant in every living organism. In *gametic* or egg cells there are n-number of chromosomes, while in *somatic* or body cells there are 2n number of them. When the number is the same as the gametic number (n) the individual is referred to as *monoploid* or *haploid*, but when it is an exact multiple of the basic number (2n), it is considered as *diploid*. Consequently, a *polyploid*, is an individual possessing more than two sets of the monoploid. In this category, there arises the *triploids* (3n), *tetraploids* (4n), *heptaploid* (5n), etc. On the other hand, when the individual possesses a nucleus or tissue with some number other than an exact multiple of the monoploid number it is known as *aneuploid;* thus, a number which is a little lower than some multiple is called *hypoploid;* and when it is a little higher, it is considered as *hyperploid.* Further classification is made on *aneuploids* such as the *nullisomic* (2n-2) and *polysomic*: *simple trisomic* (2n + 1); *double trisomic* (2n + 1 + 1); *monosomic* (2n — 1); and *tetrasomic* (2n + 2).

Based on the aforementioned numerical classification of the chromosome, one may be able to group the varieties, species, genera, families, classes, and orders, accordingly. This has been availed of in considering relationships in the plant kingdom. It is generally known that certain plant groups show definite tendencies in chromosome number. Most fungi have very low chromosome number while the ferns have a high number. For example, the *Equisetums* have a uniform 108 haploid number, the *Psilotum* 100 to 200 chromosomes, and *Tmesipteris* over 400 chromosomes in diploid cells. Diploid numbers in *Lycopodium* range from 48 to as high as 260; in *Isoetes* from 20 to over 100; but in *Selaginella* there is a low and uniform haploid number of only 9.

Polyploids are found throughout the plant kingdom with the exception of the lower plants. Among the gymnosperms, they are found in *Gnetales.* Most coniferous species belonging to the genera *Podocarpus*, *Sequioa,* and *Juniperus* are also within this category. Other genera belonging to this class are mere diploids that differ ordinarily in their respective somatic number.

On the correlation of basic chromosome number with growth habits, woody plants have higher basic number than herbaceous types. This is partly explained by their polyploidal origin. A perplexing problem that could be cited to illucidate some of the cytotaxonomic importance of the chromosome is the admission of certain species into a genus, or certain genera into a family. In this case, a survey of chromosome number could be conducted similar to that of the *Gelsemium, Polyprenum,* and *Buddleja,* which are retained in the *Loganiaceae* (Strychnine family). Cytologically, several other families of the higher plants can be further investigated and evaluated throughout the plant kingdom, most especially in the angiosperms and gymnosperms. Incidentally, most findings are just cytological in nature and not always correlated with taxonomic problems. In this area, therefore, there is an urgent need of plant taxonomists who have previously acquired a scientific background in cytology to handle effective researches of such nature.

*Chromosome morphology.* In morphological studies, the size and other heritable structures of the chromosome are of great interest to the reasearch taxonomist. This is due to the fact that some species possess the same chromosome number and differ only in chromosome structure which is caused by the rearrangement of the chromosomal segments. One of the foundations of cytotaxonomic evaluation and interpretation is based on this fact which boils down to its usefulness in the critical analysis of species-hybrid relationships and origin.

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The majority of woody genera have smaller chromosomes than their herbaceous relatives. Likewise, the annuals have smaller chromosomes than the perennials. In ferms, for example, the members of the family *Osmundaceae* (Osmunda family) have the largest chromosome, the somewhat more advanced *Polypodiaceae* (Common fern family) are intermediate, and the specialized *Salviniaceae* (Salvinia family) are the smallest.

With advances in cytological techniques, it has been possible to add such stable features of the chromosome as the *satellite* and the *kinetochore*. The former is a small rounded body attached to the chromosomal tip by a cord of considerable length, while the latter is a constriction located at a definite position on the chromosomal arm. The following instances exemplify the taxonomic importance of these cytological features of the chromosome. In *Boraginaceae* (Borage or Anonang family), there has been a disagreement as to the proper disposition of *Brunnera macrophylla* John. Should it be in the genus *Brunnera* or in the genus *Anchusa*? Cytological evidence very clearly showed that *Brunnera* and *Anchusa* are distinct genera each having an entirely different chromosome number and size. In addition, the comparative morphology of the somatic chromosomes of *Rheum palmatum* L. and *Rheum Franzenbachii Muent.* revealed that each has one pair of chromosomes with satellites; whereas, *Rheum Emodi* Wallich and *Rheum undulatum* L. has two pairs of chromosomes each with satellites. In *Zea*, the number of the chromosome knobs( satellites) varies from O in some varieties to 14 in others. This serves, therefore, as a criterion in determining the relationships of various kinds of corns which is a problem that is becoming increasingly important in modern maize breeding. Differences in satellite size and position might be equally useful as a tool in studying taxonomic as well as breeding relationships. In *Nicotiana* chromosome morphology and size is sufficiently distinctive in many species to possess significance for interpretations of their origins. This again confirmed the current taxonomic arrangement of the genus which had remained questionable for a considerable length of time. Meanwhile, the constrictions play an important role in taxonomy because they are constant in position. Studies based on this morphological characteristic of the chromosome were conducted and used to advantage in the genera *Velthemia, Allium, Cyrthanthus, Gasteria, Aloe, Haworthia*, and many others.

*Other cytological features.* Extra-nuclear structures which are of some taxonomic significance are the nucleolus, chloroplast, and some ergastic substances. These features have been used in differentiating some varieties of rice. In the green algae, the chloroplast serves as the primary basis of species diagnosis. For example, *Ulothrix* has a chloroplast like a hollow cylinder or folded book; *Draparnaldia*, hollow with irregular ends; *Oedogonium*, irregular, parietal network; *Spirogyra*, spiral; *Zygnema*, two star-shaped chloroplast; *Protococcus*, platelike; *Cosmarium*, flat and discoidal. In the higher plants, the discoidal or small platelike chloroplasts are more common than in the algae. Little difference, however, can be observed between chloroplasts of distantly related seed plants which are placed quite far in the systematic scheme.

Ergastic substances such as crystals, oils, and other forms can be of value to the taxonomist in his segregation and subsequently identification of species. Direct application would therefore be centered on the differentiation of closely allied species based on what deposits are stored in the wood cells. For instance, the presence or absence of crystals in the cells of the dipterocarps can be of diagnostic importance because of their readily recognizable optical properties. This is exhibited by the differentiation of *Shorea philippinensis* Bran-

dis which is silica-accumulating and *Shorea kalunti* Merr. which is silica-free. Other deposits such as oils in the *Leguminosae*, resins in the *Dipterocarpaceae*, and other ergastic substances in various other plant families, could be similarly investigated by the wood anatomist to serve as an adjunct to existing taxonomic evidences.

*Summary and Conclusion*

It has been shown that cytology in its more recent developments has proven its value in clarifying some of the problems of species as well as genus complexes. From this study, it was indicated that phylogenetic relationship within a genus can be accurately formulated only when the number, morphology, and other stable cytological features are correlated with anatomy, morphology, and taxonomy of the species. Attempt was made to search for the best taxonomic criterion among the cytological characters and it was evident that the chromosome is the most stable and reliable index for species diagnosis. The chromosome number, size, form, and other morphological characters such as satellites and constrictions can be used to clear the roadblock to species or generic demarcation. In addition, ergastic substances can also be of taxonomic value.

Unfortunately, the cytological survey of forest tree species in the Philippines has not yet been initiated due to the lack of personnel with cytological training. It is claimed that our country is endowed with the finest tropical hardwood forests in the world. Therefore, there are many known and unknown species exhibiting similarities as well as differences in morphological characters. In the Dipterocarpaceae, for example, are found two commercial species which are closely related, namely: *Shorea polysperma* (Blco.) Merr. and *Shorea negrosensis* Fox. These two species are so closely related that even the trained wood anatomist has difficulty in differentiating them. A considerable number of investigations have already been conducted only to find out that their segregation or differentiation is still an enigma awaiting further satisfactory evidences. This is a situation which calls for a cytologist with a dendrological background to undertake research along this field in order to reveal some of the hidden secrets of our forest trees. The time is already ripe for qualified investigators to undertake a comprehensive study of the generic and family relationships of our forest trees, utilizing the facts from morphology, geographic distribution and cytology.

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LIST OF SPECIES . . . .

(*Continued from page* 34)

| *Species* | *Scientific name* | *Family* |
|---|---|---|
| 3) Malakalumpang | *Sterculia ceramica* R. Br. | Sterculiaceae |
| 4) Narra | *Pterocarpus indicus* Willd. | Leguminosae |
| 5) Rarang | *Erythrina subumbrans* (Hassk.) Merr. | " |
| c) *Ripple marks* | | |
| 1) Narra | *Pterocarpus indicus* Willd. | Leguminosae |
| 2) Bayok | *Pterospermum diversifolium* Blume | Sterculiaceae |
| d) *Color* | | |
| 1) Afu | *Anisoptera brunnea* Foxw. | Dipterocarpaceae |
| 2) Anang | *Diospyros pyrrhocarpa* Miq. | Ebenaceae |
| 3) Anang-gulod | *Diospyros inclusa* Merr. | " |
| 4) Dagang | *Anisoptera aurea* Foxw. | Dipterocarpaceae |
| 5) Dao | *Dracontomelon dao* (Blco.) Merr. | Anacardiaceae |
| 6) Palosapis | *Anisoptera thurifera* (Blco.) Blume | Dipterocarpaceae |
| 7) Uas | *Harpullia arborea* (Blco.) Radlk. | Sapindaceae |
| e) *Flaky or silver figure* | | |
| 1) Kalimatas | *Phaeanthus ebracteolatus* (Presl.) Merr. | Annonaceae |
| 2) Katmon | *Dillenia philippinensis* Rolfe | Dilleniaceae |
| 3) Mabunot | *Stemonurus luzoniensis* (Merr.) Howard | Icacinaceae |
| 4) Malakatmon | *Dillenia luzoniensis* (Vid.) Martelli | Dilleniaceae |
| 5) Philippine oaks | *Lithocarpus* spp. | Fagaceae |
| 2) *Figure caused by grain variations and irregularities.* | | |
| a) *Raindrops* | | |
| 1) Pianga | *Madhuca obovatifolia* (Merr.) Merr. | Sapotaceae |
| b) *Mottle* | | |
| 1) Apanit | *Mastixia philippinensis* Wang. | Cornaceae |
| 2) Himbaba-o | *Allaeanthus luzonicus* (Blco.) F.-Vill. | Moraceae |
| 3) Lamog | *Planchonia spectabilis* Merr. | Lecythidaceae |
| 4) Liusin | *Parinari corymbosa* (Blume) Miq. | Amygdalaceae |
| c) *Ribbon figure* | | |
| *Philippine mahogany species (already given above)* | | |
| 3) *Figure caused by irregularities in the tree* | | |
| a) *Knots* | | |
| 1) Anubing | *Artocarpus ovata* Blanco | Moraceae |
| 2) Bitanghol | *Calophyllum blancoi* Pl. & Tr. | Guttiferae |
| 3) Margapali | *Dehaasia triandra* Merr. | Lauraceae |
| 4) Molave | *Vitex parviflora* Juss. | Verbenaceae |
| b) *Crotches* | | |
| 1) Acacia | *Samanea saman* (Jacq.) Merr. | Leguminosae |
| 2) Molave | *Vitex parviflora* Juss. | Verbenaceae |
| 3) Narra | *Pterocarpous indicus* Willd. | Leguminosae |

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# Root Grafts of Forest Trees: Their Occurrence and Silvicultural Implications[1]

*By*
IRENEO L. DOMINGO[2]

## INTRODUCTION

The assumption that trees in a forest stand are discrete, physiologically independent individuals, and competing with each other for survival and growth seems to have gained universal acceptance in the scientific forestry world. The forest tree is often considered an independent organism whose principal relationship with its neighbors is one of competition for light, water, and minerals. Consequently, studies on forest trees as well as forest management practices have been resting on this assumption. But perhaps, coincident with the evolution of this assumption, there has been a gradual and slow accumulation of knowledge concerning the phenomenon of natural root grafting among forest trees. This phenomenon seems to run contrary to the assumption and seems to have been overlooked by botanists and foresters. Scientific investigations as well as empirical observations on this phenomenon have been reviewed, interpreted, organized and presented in this paper. Most of the materials gathered are of foreign origin. The findings, however, are of general application and, therefore, important to Filipino foresters and botanists. Observations of the author on Philippine forest tree species and the implications of the phenomenon on some silvical concepts and silvicultural practices are included.

### *Definition*

A natural root graft is the union or fusion of two or more roots of one or more trees of the same or different species (38).[3] There is a continuity of the wood elements at the union. The mere rigid contact of the roots where there is no continuity of the wood elements is not a true graft.

### *Forms of Root Grafts*

Natural root grafts among forest trees occur in several forms. Two roots of the same or different sizes may come in contact with each other by crossing each other forming angles approaching the perpendicular or acute angles. This type of graft may be called an *intersection* (21, 26).

Roots from the same or opposite directions may also come in contact with each other in a more or less parallel fashion and unite together to form a *longitudinal graft.* In this case the united portion may be just the point of contact or extends to a meter or more (21).

When a root joins another at one point but does not separate at the other end, a *bridge-root graft* is formed. This type may be formed in two ways, namely, by a

[1] Revised text of a paper submitted to the Department of Botany, North Carolina State College, Raleigh, N.C. as a requirement for a course in Plant Ecology. Read before the Los Baños Biological Club during its 307th regular scientific meeting on November 27, 1963 held at the College of Forestry auditorium.

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[3] Numbers enclosed in parenthesis refer to bibliography.

branch-root penetrating the bark of another root and a union of the vascular elements is later formed (31) or by having an intersection or a longitudinal graft where the distal end of one member of the union has deteriorated and covered with wood tissues (21).

Root grafts may also be in the form of a *web-graft* appearing like a "duck-foot" anastomoses of roots. In this type, several roots join together and form a single root (21).

There are *apparent grafts* wherein roots come in contact with each other and form a rigid connection but there is no union or continuity of the wood elements. These are not true root grafts in the sense that they do not meet the requirements of a true root graft, *i.e.*, continuity of wood elements. For purposes of identification, however, these apparent grafts could be designated as such. Besides, they may eventually become true grafts.

Depending upon the species of the participants of a union, grafting may either be *self-*, *intra-specific*, or *inter-specific* root grafting. Self-grafting is a fusion between two or more roots of the *same tree;* intra-specific root grafting is a fusion of two or more roots of two or more trees of the *same species;* and inter-specific root grafting is a fusion between two or more roots of two or more trees of *different species.*

### *Evolution of the Knowledge on Root Grafting*

Knowledge of the occurence of root grafts among forest trees dates back to centuries before Christ when Theophrastus, the Greek Aristotelian philosopher and natural scientist, described new growth of stumps of trees (21) which, in the light of a growing knowledge, may be interpreted now as manifestation of root grafting. The "growing stumps" aroused the curiosity of botanists in Europe and led to the discovery of root grafts in the forest. In 1929, Laitakari (31) reported that a certain Franke reported in 1881 that a certain Reum proved in 1835 that the roots of trees in a forest form a continuous labyrinthine network by growing into each other. In the same report, Laitakari stated that a certain Liese explained that root grafting is due to hard pressure caused by the growth of roots, a view that is shared by probably most present or recent workers.

Literature on natural root grafting or its manifestations began in the North American continent during the end of the 19th century. In 1899, Lamb (33) described of seemingly dead broken root stubs but alive when cut and called them "root suckers". In 1913, an anonymous writer (1) reported that stumps of Cuban pine (*Pinus heterophylla*) and Longleaf pine (*Pinus palustris*) in Florida especially those growing on wet or moist soil continued to put on narrow annual rings of woody tissues for a number of years after being felled. He attributed this phenomenon to the joining of the roots of the stumps with the roots of adjacent intact trees. His view was later supported by Newins (38), Page (40), and Pemberton (42). The anonymous writer and these men were probably the first ones to ponder on the physiological and practical significance of root grafts. Their findings generated interest on root grafts.

Knowledge on the occurence of root grafts in tropical trees began in 1952 when LaRue (35) reported several cases of root grafting on several tree species in Puerto Rico.

Despite the growing knowledge on natural root grafting, botanists and foresters do not usually consider the significance of root grafts in their scientific studies and practices.

### *Factors Influencing the Formation of Root Grafts*

A number of factors have been suggested to have bearing on the formation of root

grafts among forest trees. When the roots come in contact with each other, root pressure is produced as both roots grow. The pressure becomes great as the roots continue to expand and gradually forces away the cortex at the two edges of contact. The exposed cambiums at the point of contact then unite whenever there is afinity or similarity in the structure of the vascular wood elements. The united roots then grow as one and thus a root graft is formed (26, 31, 38, 51). Flury (19), however, said that pressure is unnecessary. Flury potted seedlings of a few forest tree species and arranged their roots in crosses. By means of wooden clamps, pressure was exerted on the root systems. The plants did not develop any case of root grafting after a certain period of growth.

According to Nienstaedt, et. al. (39), the following are the steps in the process of root grafting: 1) formation of a contact layer, 2) development of callus, 3) elimination of the contact layer and beginning of callus differentiation, 4) union of the vascular elements, and 5) formation of a common cambium.

It was claimed that when the trees are swayed to and fro, movements of the roots are generated and when they are in contact with each other there is friction causing the barks to be worn off fusing the meristematic tissues (15, 45). It is doubtful, though, whether swaying of trees by the wind could induce movement of the roots (34, 38). It is probably true only in a site where the soil is loose enough to allow root movement as a result of the movement of the tree's aerial parts by strong wind.

The soil may play a part in the formation of root grafts. A firm soil serves as a support that prevents diameter growth from pushing apart the roots which have come in contact thereby helping increase the pressure develop between the two roots. A firm soil also facilitates removal of the cortex before fusion of the wood elements occurs (34).

Whether or not the exposed cambiums would readily fuse together depends a great deal upon the similarity or afinity between the cambiums of both roots (26, 34). The anatomical knitting of the union is faster when the wood elements are alike. The sequence of anatomical changes taking place during the knitting of the union varies from species to species (39). Roots of different species are not expected to fuse very readily because of anatomical difference in the roots.

Species with wide-spreading lateral roots may unite more readily than species of deep penetrating but less lateral roots (38). The reason is that in a stand of species with wide-spreading lateral roots there are more chances for contacts between roots. Frequency of contacts between the roots increases with the increase in the density of the stand. Trees growing closely would have a network of interlacing roots with more points of contacts and, therefore, subsequent development of unions is facilitated.

The age of the trees has also been mentioned as one of the factors in the formation of root grafts, although there is a disagreement here. Kozlowski and Cooley (26) maintained that more numerous grafts have been reported by workers in older stands. The grafts in older stands, however, obviously include grafts that were formed during early age. Examinations made by Newins (38) of cross sections of some grafts revealed that most grafts found between older trees were actually formed at early age. Therefore, grafting may begin at early age and the number increases with age, as the stand matures.

Root grafts may occur in any size of roots except the "absorption roots", *i.e.*, the very small roots whose function is mainly the absorption of moisture and nutrients. Absorption roots are elastic and their cells have a structure different from bigger roots. New cells are added by cell multiplication at the growing tip just beneath

the epidermal layer and from outside inward, making it almost impossible for grafting to occur. Only after these roots have formed cambium rings and grow by cell division from the inside outward, when grafting becomes possible (19).

*Occurrence*

Natural root grafting occurs in a number of species of both gymnospermous and angiospermous trees (26). They occur in the temperate regions as well as in the tropics.

In the temperate regions, root grafting is very common in coniferous trees (15, 21, 38). The literature indicates that it is less common in hardwoods but it is probable that it appears to be so only because there has been less interest in them. There have been very few studies on hardwoods in which the objective is solely about root grafts. Discovery of root grafts among hardwoords has been made mainly in connection with pathological and grafts among hardwoods has been made silvicultural studies or operations.

On the occurrence of root grafting in the tropics, LaRue (35) found root grafts in thirty-four genera belonging to eighteen different families of forest trees in Puerto Rico.[4] LaRue believed that root grafting is common in tropical trees and perhaps more common than in the temperature regions. Baldwin (5) also believed that tropical trees and vines are especially prone to join their members.

In the Philippines, the author observed cases of grafting of the exposed roots of a few species at the University of the Philippines College of Forestry campus and at some other places in Northern Luzon. At the Forestry campus, almost every large-leaf mahogany (*Swietenia macrophylla* King) tree along the road in front of the College of Forestry administration building is connected to another tree of the same species through their roots (Fig. 1). In one case (Fig. 1-A), at the end of the left wing of the building, a tree that was cut about eight years ago and a root of which is grafted to an adjacent tree is still alive and sprouting. Presumably, the stump should have been dead now had it not been for the root connection with the adjacent living tree (see discussion under Silvical and Silvicultural Implications). East of the same building, the roots of two small-leaf mahogany (*Swietenia mahogoni* Jacq.) trees about five meters apart are grafted together (Fig. 2). In front of the administration building beside the road, exposed roots of two molave (*Vitex parviflora* Juss.) trees are grafted together (Fig. 3). Along Racelis street near the Forestry Mess Hall, a case of inter-specific apparent root grafting between large-leaf mahogany and kalantas (*Cedrela calantas* Burk.) was observed (Fig. 4). Self- and intra-specific root grafting were also observed on molave at the Nasiping Reforestation Project in Gattaran, Cagayan, on large-leaf mahogany at the Paraiso Reforestation Project in Piddig, Ilocos Norte and on Benguet pine (*Pinus insularis* Endl.) at the experimental area of the Magat Forest Experiment Station in Bagabag, Nueva Vizcaya.

Natural root grafting probably occurs more commonly in some regions than in others (5). This is very obvious considering the existence of various geographic races, clines, and other variations among species and considering the obvious differences among the different site factors that could influence root graft formation. Genetic differences probably affect the ability of the individual trees to unite together their own roots or with the roots of others.

More root grafts occur in dense than in open stands (30). As pointed out earlier, there are more points of contact between

[4] The author also observed several cases of root grafting of trees when he was undergoing an observation tour in Puerto Rico as a participant of an AID-NEC program.



Figure 1. Intra-specific root grafts of large-leaf mahogany. One graft in *A*, two grafts in *B*, and four grafts in *C*. In *A*, the 8-year old stump was sprouting, an indication of its dependence on the intact tree.



Figure 2. Intra-specific root graft of small-leaf mahogany. The trees were about five meters apart.


*B* is a close-up of the graft in *A*.

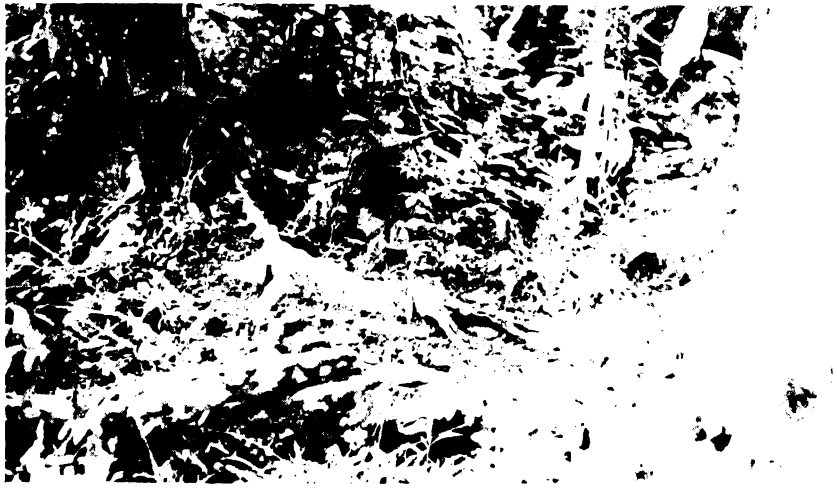

Figure 3. Intra-specific root graft of molave.



Figure 4. A & B — Inter-specific apparent root graft between Calantas and large-leaf mahogany. This apparent graft may eventually become true graft as the roots continue to grow together.

roots in a dense stand than in an open stand as a result of the greater degree of interlacing between the roots. There are more root grafts in older than younger stands (26, 30) although it was also claimed (21) that grafting begins at early age and leads to mature stands consisting of much grafted trees interspersed with occasional ungrafted individuals. Grafting also occurs between roots of the same or different sizes (12, 26, 50) or between trees of the same or different sizes (31). Grafting of roots as small as only one-eight inch in diameter have been observed (26).

Self- and intra-specific root grafting are very common (3, 6, 12, 21, 22, 28, 34). But whether self-grafting occurs more commonly than intra-specific root grafting or *vice versa* is not yet definitely established. Logically, self-grafting should be more common since the roots of the same tree are closer to each other than to the roots of another tree and also since the roots are more likely, if not completely, to be the same in anatomical structure which determines readiness for fusion after the cortex of both roots has been removed. It was claimed (21), however, that the predisposition of a species to self-grafting should be indicative of its intra-specific grafting potential.

Inter-specific root grafting is rare if not very rare (6, 14, 30, 34, 41). This is because of the dissimilarity of the anatomical structures of the roots which do not permit ready fusion of the wood elements.

For intra-specific grafting, the distance between two trees connected together through root grafts may be as close as only two feet (6) to as far as fifty feet apart (5). For self-grafting, the graft occurs principally close to the base of the tree (31, 32).

Since trees of the same species are more susceptible to root grafting than trees of different species, it follows that root grafting would be more common in a pure stand than in a mixed stand especially in a stand where there is a perfect mixture of species.

### *Physiology of Root Grafts*

Numerous investigators have demonstrated that root grafts are functional in the transport of food materials from one tree to another. Dyes, poisons, and radioactive substances have all been introduced into trees in some forest stands by several methods and after enough time, they were found to be present on adjacent untreated trees. This means that the substances passed through underground root connections or root grafts since there is no other possible means of spread or transfer above the ground (5, 6, 12, 13, 14, 15, 17, 20, 21, 22, 23, 30, 37, 40, 41, 48, 49, 51, 53).

In addition to the above findings, the substances have also been found, where the grafted trees are in the same crown class and of the same vigor, to move in both directions. When the participants of a union are dominant and overtopped trees, the movement is from dominant to overtopped tree (30). This could be very important in some silvicultural practices and concepts.

Pathogenic organisms, inoculated to healthy trees, have also been observed to have become established on neighboring trees of the same species by passing through grafted lateral roots (41, 51, 52). In other studies, spread of pathogenic organisms has been found to be correlated with the spread of dyes, poisons, and radioactive substances to other trees. These would mean that root grafts seem to offer ideal "pipelines" or pathways of pathogenic organisms in their spread to other trees (3, 6, 14, 15, 17, 22, 25, 28, 29, 30, 38, 49, 50, 51).

### *Methods and Materials for the Study of Root Grafts*

Detecting and studying root grafts and its physiology have largely been confined to the use of such materials as dyes, poisons, and radioactive substances. The fol-

lowing have been used by numerous investigators: fuchin dye (12, 21), azosulfamide dye (49), ammonium sulfate (12, 13), sodium arsenite (6, 15, 17, 41, 48, 49, 53), copper sulfate (12, 14, 21, 30, 49), iodine$^{131}$ (6, 12, 30), and radioactive potassium bromide (18, 30). Any of these substances can be introduced into the tree or stump by several methods and after a certain period of time, the neighboring trees are examined or observed for the effect. If they are affected it can only be interpreted that the substance passed through underground connections. Checking of this assumption usually involves excavating the root systems of some trees that are affected. The methods of introducing the substance to the tree may be 1) several ways of injecting the substance into the tree, 2) girdling of the tree followed by painting with the substance (15, 48, 53) 3) frill girdling in which the frills are filled up with the substance, and 4) water-tight walls made around the top of the stump where in the substance is poured over (14, 21).

In injection methods, the injection of the substance should be done all around the tree and not on only one side. This is to avoid the unequal translocation of the substance to the roots. Auchter (2) found that translocation is mainly up and down the tree and practically nothing radially. Application of the substance to only one side of the tree would, therefore, lead to erroneous results and conclusions.

Inoculation of the tree with pathogenic organisms had also been used. Five wedge-shaped pieces of bark and wood of *Quercus velutina,* infected with *Endoconidiophora fagacearum,* were inserted into corresponding cuts in the healthy surface roots of other oak trees by Weir (52). The fungus became established on neighboring trees after a few years. A study on the Dutch elm disease was also conducted by Verrall and Graham (51) in the same manner. This procedure, however, has the disadvantage of being not too reliable since the disease can reach neighboring trees by some means other than through root grafts.

Root grafts can also be detected by the presence of living stumps, since stumps that are alive after a number of years after felling are in most cases grafted to nearby living trees.

*Silvical and Silvicultural Implications*

From the informations gathered on the occurrence and physiology of root grafts of forest trees, silvical assumptions, concepts and phenomena could be more logically explained. In addition, some silvicultural practices or treatments could be modified and/or carried out more confidently based on a more solid foundation.

The literature indicates that natural root grafting is a common phenomenon in most, if not all, forest tree species. It also indicates that root grafts are functional in the transport of water and food materials as has been demonstrated by the translocation or movement of various chemicals, dyes and radioactive substances through root grafts. Therefore, the assumption that the individual trees comprising a forest stand are discrete, physiologically independent of each other is doubtful. A tree living side by side with other trees may not be an independent organism. From all indications, a stand of trees is a community of interdependent individuals, each tree having lost its individualty through root grafts. If the members of a union are both of the same crown class or of the same vigor, the movement or translocation of water and food materials is from both directions. There is a free interchange of water and food materials between the members of a union. If the members belong to different crown classes, for example overtopped and dominant crown classes, the pattern of the exchange of materials is altered by bringing about a shift in gradient of sap stress or pressure

in the union (11). This shift in gradient may bring about movement of materials from the dominant to the overtopped tree. The life or survival of a tree may, therefore, be conditioned by its ability to dominate its physiological relationship with another tree to which its roots are grafted (9). The relationship may be one in which a tree stands to be benefited more than the other or one in which a tree suffers and the other is benefited. The overtopped tree is benefited since it could derive a part of the growth materials for its survival from the dominant tree. On the other hand, the dominant tree suffers because it does not only supply food materials to its own parts but also to the overtopped tree. In other words, the overtopped tree depends, in part, for its survival on the dominant tree (12, 30, 48). In this kind of relationship, physiological competition[5] is eliminated, which means that the various phenotypical differences in a stand is not physiological in nature but merely brought about by physical competition, genetic variation, and earlier start of rapid height growth[6] during the early life of a stand. The trees compete only for space, *per se*, and not for light or soil nutrients, since a dominant tree supplies food materials to another tree that is less vigorous and to which its roots are grafted. The greater amount of water and nutrients absorbed and of the light received by the dominant trees are of no consequence because the property of the dominant trees becomes also the property of the overtopped trees. The overtopped trees are smaller and continue to be smaller than the dominant trees because there is a smaller space for their crowns to occupy and not because they receive less light or less water and soil nutrients.

One corroborating evidence for the dependence of the overtopped trees from dominant trees and the presence of physical competition instead of physiological competition is the persistence of said overtopped trees. Since the overtopped trees persist for a long time despite the fact that the food they manufacture is assumed to be much lesser than their needs, it is safe to assume that the other food material is supplied by the grafted dominants. The dominants, therefore, assist the overtopped trees in their survival and growth (12, 30, 48).

The response of trees to thinning in a pure stand of root grafted trees depends upon the degree of competition for space. If the competition is not yet too intense, the rate of growth of the trees left after thinning increases. On the other hand, if the competition is already too intense, the trees may die. These two phenomena could be explained by the presence of root grafts.

The increased growth of trees left after thinning a stand that has not yet reached the extent of extreme competition may be attributed to the increased photosynthate utilized by the trees. This increased photosynthate is due to the utilization of the photosynthate stored in the stumps and roots of the trees that were cut in the thinning operation and to the increased root surface area for absorption as a result of the use of the root systems of the stumps by the intact trees. After thinning the roots of the stumps enter into the "service" of the intact trees since root grafts are functional in transport. The trees left after thinning can more quickly utilize moisture and materials from a large body of soil through the use of the roots of the cut trees (9, 10, 12, 22, 30, 31, 40, 48). This explanation is more logical than the popular belief that the growth response is due to increased light conditions and de-

[5] The terms "physiological competition" and "physical competition" are coined here to distinguish competition for growth materials and for space alone, respectively.

[6] The height growth pattern of a tree is made up of three stages, namely, a brief period of juvenile acceleration, a period of very rapid growth in the sapling and pole stages, and a relatively long period during which height growth is slow (or period of a decceleration) (4).

creased root competition. With the presence of root grafts in a pure stand, the latter explanation is not logical because the roots of the intact trees could not possibly expand so rapidly since the root systems of the cut trees continue to live and occupy the open spaces. Root competition, therefore, is not actually decreased after thinning. Besides, according to Graham (21), the growth response comes too soon to be considered a reflection of crown and root expansion.

The phonomenon regarding the dying of trees left after thinning may be related to the extent of the physiological relationship of overtopped and dominant trees that are connected together through the roots. If the relationship has gone to the extent that the overtopped trees have long been nurtured by or dependent entirely from the dominant trees for survival, the former succumb when the latter are cut since the supply of food to the former is suddenly cut off without gradual adjustment to the new situation (24). Therefore, removal of the dominant or codominant trees during thinning would result in dying of the intermediate or overtopped trees that are left.

Consideration of the two phenomena mentioned above may greatly help in making decisions in thinning. It could lead to an easier choosing of what method to use, whether to thin from above (crown thinning) or from below (low thinning).[7] If the physiological relationship has reached the point where the overtopped trees entirely depend on the dominants, leaving the overtopped would result in dying of the trees left. On the other hand, low thinning or cutting the overtopped and leaving the dominants would be good because the roots of the former could enter into the "service" of the latter and thus increases the growth of the trees left.

[7] Thinning from above or crown thinning is one in which trees are cut and removed from the middle or upper portion of the range of crown and diameter classes (47).

The phenomenon could, likewise, help decide what tree to cut during thinnings and during harvest cuttings (except clear-cutting). If one could tell definitely, by using refined methods, which tree is grafted to another, what is the relationship of the participants, and which member stands to be benefited from the union, mistakes in the selection of trees to cut are minimized as far as the objective is increased growth of the trees to be left.

Spacing in the establishment of plantations, schedule of thinning, and rotation may also be influenced by the phenomenon. It might be advisable, for example, to plant closely during field planting operations with the end in view of producing a dense stand at early age to hasten or encourage the development of intra-specific root grafts. The thinning series then could be started at an earlier age which means that the beginning of rapid growth as a result of the thinning is also earlier resulting eventually to a shorter period of growing the trees to a required size. Thus it is possible to shorten the rotation.

The development of root grafts in a stand may also influence the level of thinning through its effect on the rigidity to anchorage. It is true that trees in a dense stand, when suddenly exposed to strong winds after heavy thinning, are very susceptible to windthrow. A stand may need a heavier thinning level by reason of the silvical requirements of the species but the species might happen to be susceptible to windthrow when exposed after thinning so that a heavy thinning level is not possible. This limitation that windthrow imposes on thinning level could, perhaps, be weighed best by the silviculturist if he knows the presence or absence of self- and/or intra-specific root grafting and to what extent this would resist windthrow. Unfortunately, this area has not been thoroughly investigated beyond merely suggesting that root grafts could increase the mechanical efficiency

of the roots to anchorage. Logically, however, it is possible that the presence of root grafts in trees give rise to increased rigidity in anchorage and thus mechanical efficiency of the root systems (12, 19, 31, 44, 45). In a stand where there is a high degree of root grafting, the network of grafted root systems offers a concentrated resistance or force against the stresses in the aerial parts of the trees that otherwise lead to up-rooting and throwing down of trees by heavy winds. Therefore, a higher development of grafted network might enable some species to persist where others fail. This is especially advantageous in places where the soil is thin and where the roots are restricted to the upper strata of the soil. It is also advantageous to a stand growing in moist soil containing little rock. This effect of root grafting may explain, in part, the observation that trees growing singly are more susceptible to windthrow than trees that are growing in groups.

In forest management, it is sometimes necessary to girdle trees that are either of no commercial value or they are out of place. Logically, when a tree is girdled, the phloem, which is the passage of food from the leaves downwards, is cut off. The parts of the tree below the girdle should, therefore, fail to benefit from the manufactured foods from the leaves and the tree should eventually be killed. Instead of being killed, however, girdled trees most often persist to grow or if killed it is only after a long period of time (15). Root grafting probably could be one of the reasons for this phenomenon. If the girdled tree is connected to an intact tree through root grafts and since root grafts are functional in translocation the intact tree could supply the food materials that the part below the girdle of a girdled tree lacks (22).

Following felling, the stumps of trees continue to live and grow by making use of the photosynthate stored in the roots. Since the top portion of the tree which is responsible for food manufacture is removed, the photosynthate stored in the roots and stump is not being replaced so that eventually the stump should die the moment the stored photosynthate is exhausted. Instead of dying, however, stumps have been observed to continue to live and put on some growth for a number of years. There must, therefore, be a photosynthate that replaces the exhausted stored photosynthate. An adjacent tree could be the only possible "donor" to this replacement through its roots that are connected to the roots of the stump. The presence of root grafts, therefore, could explain several observations that stumps of trees after partial cuttings of forest stands or after thinning continue living and putting on some growth for a number of years. In Fig. 1, for example, the mahogany tree was felled about eight years ago but when the picture was taken in April, 1963, it was still alive and sprouting. As stated earlier, the stump should have been dead now had it not been for the photosynthate supplied by the intact tree. The photosynthate that is supplied to the stump may also have induced the sprouting. The vitality of the intact tree might have been extended to the stump and helped increase activity of cells in the wound thereby inducing the buds hidden under the bark to grow and became sprout.

In forest tree weed control, chemical application has been used extensively and proved to be a success in eliminating weed trees. Almost always there is complete kill for a relatively much shorter time than simply girdling without chemical application. Likewise, chemi-peelings[8] and chemical thinnings have proved successful. Coincident with the success of chemical applications, however, is the growing ap-

[8] Chemi-peeling is done by treating pulpwood trees with a chemical a few months before scheduled cutting. The obective is to allow the bark to peel off before cutting the trees. In chemical thinning, trees that are normally removed but not profitable are killed with chemicals instead of being cut.

prehension about "backflash" which is the sickening or sudden death for no apparent reason of untreated trees in a stand where chemical treatment of other trees has been done (15). Numerous investigators have attributed this backflash to passing of the chemical from treated to untreated trees through root grafts (11, 12, 13, 15, 22, 26). The silvicultirst should, therefore, be very careful in treating trees with silvicides. He should determine first the extent of root grafting in the stand before resorting to chemical applications. If root grafting is numerous, perhaps girdling alone, despite its disadvantages, may be a better method of eliminating tree weeds than chemical applications.

One of the reasons behind the widely accepted contention that pure stands are more susceptible to disease spread than mixed stands is the fact that some disease-causing fungi have specialized hosts confined to one or a few species. If the species in a pure stand happens to be a suitable host for a particular disease, the disease could spread rapidly because the tree hosts are closer to each other. This rapid spread of the disease is further agravated by the presence of root grafts. Root grafts, as pointed out earlier, could become very effective pathways of pathogenic organisms. Since intra-specific root grafting is common and inter-specific root grafting is rare, there would be more pathways of spread in the pure stand. In the mixed stand, on the other hand, if a tree is attacked, the disease could not spread very easily to other trees, assuming other means of spread do not come into play, because there are less, if any, root grafts which serve as pathways.

Cutting the dead and other trees infected with pathogenic organisms is a well known practice in disease control. Cutting and removing the infected trees is expected to prevent the spread of the fungus based on the assumption that the fungus is also removed. The effectiveness of this practice, however, is doubted in view of the finding that pathogenic organisms are able to pass through root grafts which means that even if infected trees are cut and removed from the stand, the fungus present in the stumps and roots could still spread to other trees through the roots grafted to the roots of healthy trees. This has been demonstrated in the cases of the oak wilt and Dutch elm disease. *Endoconidiophora fagacearum* and *Ceratocystis ulmi*, the fungi causing the oak wilt and Dutch elm disease, respectively, are vascular parasites that enter the water conducting vessels of the sapwood of the tree through a wound (28, 36). The fungi, therefore, are spread to other trees when the water is translocated through root grafts. In these diseases, cutting the infected trees could not stop the fungi's spread. However, making a circular "barrier", *i.e.*, cutting a strip of healthy trees around the infected tree or area, was found to be effective (15, 17, 27, 36, 51). The barrier must be big enough so as to cut all trees whose roots are grafted to the roots of the infected trees.

The healing of the wounds of trees after pruning of the branches may be facilitated by the presence of root grafts (38). Since two trees connected together through their roots are not independent of each other, one may bestow benefits upon the other. When one is injured, as when the tree is pruned, there is a reciprocal action between the two trees in healing the wound to the extent that the healthy or uninjured tree extends its vitality to the injured tree and increase cell-making activities at the pheripheral edges of the cut. The greater the cell making activities, the faster is the formation of callus and thus healing of the wound is faster.

In ecological plant community sampling and in some forest management studies, "individual" trees are usually taken as individuals. Regardless of the objective of the sampling or the study, a tree is compared with another, directly or indirectly.

If root grafting is considered, one could question the validity of this tree to tree comparison because a tree that is grafted to another tree by the roots could hardly be compared with another that is not connected to any other tree since the former is not as independent as the latter. The rate of growth of a grafted tree is either retarded or increased depending upon its physiological relationship with the other participant of a union.

Root grafting may also explain, in part, why succession is very slow to reach the climax. The open spaces left by dead trees in a plant community of intermediate successional stage are being continually occupied by the much grafted, live root systems of stumps and intact trees. Occupancy of these open spaces by live roots may retard the invasion by other species (12, 21).

The relative amount (density) and opportunities for subsequent growth of natural reproductions returned by each of the three standard natural regeneration methods designed to bring about an even-aged stand may also be influenced by the extent of root grafting. It is easy to ensure that the appropriate vacancies are created in the potential crown space by cutting or other means. But it is not so easy to ensure that adequate volume of soil space is rendered vacant and available for new growth. If intra-specific root grafts exist, the root systems of the trees that are cut may simply be added immediately to those of adjacent uncut trees of the same species and do not die (47). Occupancy of the soil spaces by live roots sometime after cutting would be in the order of least in the clearcutting method, greatest in the shelterwood method and intermediate in the seed tree method. "Growing stumps" and live roots in a clearcut area are likely to be very few, if any, because there are no live trees left that keep them alive through grafts. Live roots in an area cut the soil spaces by live roots would present under the seed tree method are likely to be more than in the clearcut area because there are few trees left that could keep the stumps and roots of the cut trees alive. Therefore, the chance of reproductions being established would be in the reverse order, *i.e.*, least in the shelterwood, greatest in the clearcutting and intermediate in the seed tree method, assuming all other factors equal. This is because least occupancy of the least hindrance to the reproductions from getting themselves established.

Harvest cuttings with the objective of producing a coppice stand may also be influenced by root grafting. Vegetative reproductions obtained after clearcutting is usually superior to vegetative reproductions obtained after partial cutting (24). This may be explained by the utilization of the stored photosynthate in the stump. In clearcutting the stored food in the stumps is not decreased whereas in partial cutting, the intact trees may utilize the stored food in the stumps of the cut trees. Therefore, there are more food materials for the growth of the sprouts of the stumps in the clearcut area than the food for the sprouts in the partially cut area.

The situation is only true at early age, however, the reverse is true at later ages. Again this may be explained by water and nutrient relations. In an area that was clearcut, the moment the stored food in the stumps is exhausted by the sprouts, the greater vigor and growth of the coppice is not maintained. In the partially cut area, intact trees root grafted to stumps of cut trees may assist the sprouts by supplying food materials. Therefore, the rate of growth and vigor of coppice reproductions in a clearcut area is at first high but are not maintained whereas in a partially cut area, the rate of growth and vigor are not as good as those in the clearcut area but the same are maintained until the intact trees are cut in the next cutting cycle.

These water and nutrient relations, with due consideration of root grafting, may,

therefore, be useful in cutting a forest for coppice reproductions.

There may be many more implications besides those discussed here and many more may become apparent as informations continue to pile up in the literature. It must be pointed out that at the present state of knowledge, the implications mentioned here are only speculations that are only justifiable as suggestions for study. They may not be taken as absolutely conclusive pending the build up of a more thorough knowledge on this phenomenon.

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# Vital Information on Seed Handling with Emphasis on Reforestation

*By*

FORESTERS JOSE A. RAYOS,
CARLOS V. GLORI
and ISIDRO D. ESTEBAN

Seeds oftentimes offer the readiest and least expensive means of plant reproduction. This may be true, but it can also be as expensive as anyone else can imagine if the species used, and the techniques of seed handling applied are wrong.

Under the present set-up of reforestation work in the Philippines, it would seem safe to assume that 95 per cent of the seedlings that we set out in the field is being raised from seeds.

While the sum of money being spent is important, it could not compare with the success or failure of our aims to reforest as much area as we can, in the least possible span of time. The cost is insignificant; it is the success of reforestation that really matters!

Now, let us consider for a while that every single seed we sow in our nursery, whether viable or not, is going to produce a chain reaction which will directly spell the success or failure of the whole nationwide reforestation work. Let us also consider that we have an aggregate barren area of about 1.4 million hectares, which are located in critical watersheds. This needs immediate reforestation. Add to this about 50,000 hectares that are being hacked away from our dwindling forest every year, then we certainly have a gigantic task before us, a gigantic problem which is caused by deforestation.

The antidote for deforestation is reforestation, and reforestation can only be effective if the seeds that we sow are good and viable. It is for this reason that proper methods of seed handling should be well engrained in the mind of every reforestation man.

## I. *Seed Collection*

Seed collections must be done during the seed year of the species. Healthy, middle-aged and well-formed mother trees or "plus trees" must be located earlier as a source of seeds. Seeds must be gathered just as soon as the fruits mature. For species that produce dehiscent fruits containing wind disseminated or tiny seeds, it is wise to collect the fruits while still attached to the tree.

Sometimes it is possible to collect seed from selected trees on the ground during felling in logging operations. Seeds that are big can be picked up from beneath standing trees but care should be exercised, seeing to it that the seeds collected are fresh and new. Should the seeds be purchased, the purchasing officer should see to it that the source should be ascertained, and only mature, well-formed seed of average size and weight or normal fruits should be collected.

II. *Seed Treatment*

(1) Pods (legumes in pods like Ipil-Ipil, etc.): They must be placed under the sun for a few days until the pods begin to split along the sutures after which, the pods can be trampled with the feet or crushed slightly to open. The peelings then can be easily separated from the seeds by picking the empty pods. Tiny impurities, such as particles or twigs, broken pods and other foreign matters may be separated from the seeds by winnowing. Some fruits which contain sweet flesh like rain tree, can be piled in a place where there are plenty of ants or termites and the insects will feed on the sweet fleshy portion leaving the cleaned seeds behind. This practice was proven successful in the Makiling Subsidiary Nursery, College, Laguna.

(2) *Fleshy Fruits*: Seeds of many fruits must be freed from their fleshy coverings before they can be stored or planted. When there is no injury to the seeds, the fruits may be crushed or ground. It may also be immersed in water until the fleshy tissue becomes soft, then stirred vigorously to separate the seeds from the pulpy flesh. The seeds will sink to the bottom of the container. The fleshy pulp usually floats, may be poured off, the seeds collected, rewashed and then air dried.

Chemical treatments of the coverings are sometimes needed to separate membranous or resinous coatings that stick to the seeds. Seeds may be soaked in weak caustic solution or mixed with fresh wood ashes. Lime and lye also help to free many seeds of their resinous coverings.

III. *Storage of seeds.*

When seed are not borne plentifully each year, as is the case of many species and localities, the question of storage of seed from seed years and the retention of viability of stored seed have to be considered. Though some seeds retain their power of germination for many years, others lose theirs in a few weeks. Storage techniques such as refrigeration, should be applied to overcome the problem brought about by some species that do not produce seed every year; otherwise, regular planting of those species will be impossible. In places where a quarantine office is near, the seeds can also be treated with "cynogas" or "carbon bisulfide" before storage.

All seeds as long as they are viable, are alive and represent the dormant stage in the life processes of a plant. During the dormant stage, life process does not cease entirely because the seed respires and transpires, the rate of which depends upon temperature and humidity. In the Philippines, temperature varies very insignificantly, but the fluctuation of humidity covers a wide range and this is of great importance. For successful storage of seeds, moisture and temperature should be well controlled. Air tight sealed containers make ideal storage media. Under ordinary conditions, seeds of leguminous species keep long without any treatment. Seeds for storage should be well examined to find out any sign of insect or fungus attack. All seeds that are defective should be discarded.

The purposes of storing seeds are:

1. To preserve seeds under condition that best retain germinative energy during interval between time of collection and time of sowing;
2. To protect seeds from damage by insects and other injurious agencies; and
3. To preserve quantities of seeds collected during seed years and to furnish a supply during lean years.

IV. *Longevity of Seeds*

Under optimum storage conditions, different seeds vary in their capacity to remain viable and depend mostly upon the inherent characteristics of the species as follows:

1. The nature of the seed: — Seeds whose embryos are well protected remain viable for a long time like most of the species belonging to the family Leguminoseae;
2. Maturity: — Immature seeds do not have the full reserve food or the reserve foods have not been changed into stable compound which can withstand drying and prolonged storage;
3. The nature of the reserve food: — The fatty seeds are especially sensitive to the presence of oxygen. Oily seeds remain dormant longer than starchy seeds, provided moisture and temperature are controlled.

The environmental conditions that affect the viability of seeds are:

1. Temperature: — The consumption of reserve foods to support respiration is often conditioned by temperature. The life of the seed under storage depends a great deal on the temperature condition. Cold storage lessens respiration which in turn results in less consumption of reserve food and therefore lengthens storage period.
2. Moisture: — The most important factor to be considered in the longevity of seeds is moisture. Excessive moisture may either make the seed germinate or deteriorate during storage period.
3. Light: — Light acts as a stimulant to the vital physical processes in the seed. It is, therefore, believed that seeds will keep better when stored in the dark.

V. *Determination of the Quality of Seeds*

By looking at the seeds, one can determine the purity, normality of color, size and genuineness. Opening them up will reveal the wormy, moldy, or dried out condition. The three methods of determining the quality of seeds which are popularly used are:

1. Determination of genuineness, that is, whether the seed is true to the name. This can be done by comparing the seeds of known samples;
2. Determination of the purity, that is, whether there are impurities included with the lot. The percentage of purity may be determined by separating the impurities from the good, genuine seeds;
3. Determination of viability — Viability may be defined as the percentage of seeds germinable under the most favorable conditions. This can be accomplished by direct inspection, physical test, water treatment and germination test.

(a) Direct Inspection: A hand lens and knife can be used for the purpose. The seed is opened and the kernel is examined. If the kernel is firm, plump and sweet smelling, the seed is likely to be viable. If the seed is wormy, rancid, or shriveled, it indicates loss of viability.

(b) Physical Test: The seed may be placed in a red hot pan. The sudden heating causes it to pop off and finally explode. This is usually the behavior of fresh seeds. However, when seed losses its viability through over drying and later on absorbs moisture, it will also behave as fresh seeds if treated this way, which renders this method not very reliable.

(c) Water Treatment is simply immersing the seed in tap water. In the case of Benguet pine, viable seeds were found to sink, while the defective seeds float, whereas, some of the other species might behave just the other way.

(d) Germination Test is the most reliable method of ascertaining the viability of the seeds. *Germination is the resumption of growth by the embryo plant which has remained dormant in the seed.* This begins as soon as the dormant seed starts to imbibe moisture. The seed will germinate when there is adequate supply of heat, moisture, and air. Germination test may be conducted with the use of soil. Since it is not practical to test the germinative capacity of all the seeds, a means may be resorted to by taking representative samples from the whole lot.

The following steps in sampling may be used:

1. Prepare a sample of 100 to 200 seeds from the lot. A good sample is obtained by mixing together all the seeds in one lot;
2. Pile them in the form of cone;
3. Flatten the cone of seed by pressing down with palm of the hand or with a piece of board;
4. Divide into quarters;
5. Repeat the process until the sample of the average condition of the seed is obtained;
6. Examine the sample obtained by cutting them with a sharp knife and inspecting the kernel with a good lens to determine the condition of the cotyledons. The viable seeds have firm, plump and usually sweet-smelling kernel and embryo. The ratio between viable seeds and the total number inspected multiplied by 100 is the estimate of viability in per cent.

VI. *Hastening the Germination of Seed*

A forest planter aims at prompt and complete germination of seeds for several reasons, among them are:

1. To have a complete stand of seedlings in the seedbed;
2. To have the seedbed well covered with seedlings to prevent the washing off of the surface plot;
3. The uniform growth of the seedlings will prevent the establishment of weeds in the seed plot;
4. Less seeds would be needed for sowing;
5. If the seedlings will start growth together, their crowns will be more uniform;
6. Holding the seedbed too long is prevented.

VII. *Seed Treatment for Germination*

Some seeds require pre-treatment before they will germinate and unless the correct treatment is found and can be applied without much difficulty, regular establishment of the species will not be possible. Germination is effectively hastened when healthy seedlings are produced sooner. Different kinds of seeds require different treatments. The following methods may be applied:

1. Tap water treatment:—The seed is ed in tap water in varying lengths of time. Studies should be conducted because each species of seed requires different length of time immersion. Ipil can be soaked for thirty six (36) hours; Akle, for twenty four (24) hours. Seeds of Leguminous plants which have horney testa generally respond to thirty six (36) hours soaking in ordinary tap water.
2. Hot water treatment: — Studies conducted in the College of Forestry, University of the Philippines, College, Laguna, show that seeds of Anchoan germinated well by placing them in a canful of boiling water. The can is instantly removed from the fire. The water and seeds in the can are left to cool off. A method similar to this was also tried. This was called "scalding". The process was to put the seeds in an empty can, after which boiling water is poured into the can containing the seeds. The water is left to cool off with the seeds.
3. Chemicals: The most popular chemical used to hasten germination is sulfuric acid because of its corrosive properties. The length of immersion varies from a few minutes to several hours depending on the nature of the seed coat and the percentage concentration of the acid used. The highest percentage of germination of Akle was obtained for one hour when the seed was immersed in concentrated sulfuric acid. Ethyl and methyl alcohol at 95 to

100 per cent concentration had been found effective to stimulate the germination of some hard coated seeds when soaked for 2-5 hours. Alcohol does not soften the testa but rather penetrate the minute fissures which water could not enter unless alcohol preceded it. Various chemical had been tried with fair result to some but all seeds react to nitric acid, hydrochloric acid, ethylene compounds, hydrogen peroxide, liquid nitrogen, etc.

4. Scarification: — This method may be accomplished by nicking off the individual testa with a knife or file or mass abrasion of the seed in a power-drawn drum which is lined at the inside wall with sand paper. The process is rapid, when a scarifier is used but if overdone, the seed is subject to attack of insects and fungi and does not keep long.

VIII. *Shipping of Seeds*

Seeds should be shipped to their destination through the fastest, shortest, and safest route possible. Delicate and short lived seeds require extreme care in order that they will reach their destination without too much loss of viability. Seeds of rattan, lamio, amugis, oak, alupag, and dipterocarp require special method of shipment if they are to remain viable in transit for more than five days. They should be placed in a container, preferably a box, provided with small holes at the bottom and sides to provide with ventilation and prevent excessive heating. The seeds should be placed in alternate layers with moist sawdust or sphagnum moss, then wrapped with polyethylene plastic before placing in water resistant container. The plastic allows the seeds to breathe and minimizes heating. The sawdust will serve as the germinating medium should the seeds germinate while in transit.

On the other hand, when the seed are not well dried at the time of shipment, they should be shipped in a well ventilated container and dry hard charcoal be placed between them to act as dessicant. This treatment does not hold true with short-lived seeds like those mentioned in the previous page.

IX. *Germinative Capacity, Germinative Energy and Utilization Value of Seeds*:

The germinative capacity expresses the proportion of germinable seed to the total number of seeds sown. It is not necessary to extend observation until all of the viable seeds will germinate. If the test extends over three months, the observation period may be closed and viability of ungerminated seeds ascertained by the cutting test. The synonym of germinative capacity are: per cent germination and final germination percentage. Germinative capacity is computed per formula:

$$\% \text{ Germinative Capacity} = \frac{\text{No. of seeds germinated}}{\text{No. of seed samples used}} \times 100$$

This statement of germinative capacity should accompany the seeds that are being shipped to serve as a check to the loss of viability while the seeds are in transit.

Germinative force (Syn. germinative energy) is the percentage of germination attainable under the most favorable conditions in a definite period of time. The percentage of seed that have germinated up to the time the germination reaches its peak is the ratio between the number of seeds sown and the total number of seeds that have germinated multiplied by 100. The test terminates with the rapid and constant falling off in daily germination. It ends when the germination drops below two seedlings in one day, if on the following day the germination does not exceed two seedlings. In expressing the proportion, the number of days should be mentioned always, e.g., the germinative energy of Ipil seeds is 65% in twenty days.

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# National Parks Problems in the Philippines

By

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National parks in the Philippines have suffered long enough from problems whose solutions are very well within the power, command and control of the people for whose benefit and enjoyment they are established, administered and managed. In spite of government endeavor during the last thirty years since the national parks movement in the Philippines was started, it is unfortunate that our people fail to realize the many values of national parks and, consciously or unconsciously, they remain indifferent and merciless in the care of national parks, that the problems in the administration and management of national parks continue to increase in number and proportion, as time goes on.

National parks are of great importance to the social and economical welfare of mankind. They are set aside, among other things, with the primary objective of preserving the superlative examples of scenic and geologic features and also for the preservation of the fauna and flora in their natural state for the benefit and enjoyment of the people. It is impotrant that we spend enough money to bring the wonderful manifestations of nature within the easy reach of the people for their health, inspiration, education and pleasure. But our government consistently failed to provide sufficient fund for national parks development and improvement which is vital in the success of any enterprise. The Parks and Wildlife Office, which is charged with the national parks and wildlife administration and management in the Philippines, is provided with a very meager annual appropriation which hampers its program in national parks development and improvement. For the last ten (10) years (1954-1964), the government has only appropriated an average annual appropriation of ₱464,062.30 to the Parks and Wildlife Office. In the United States, the National Park Service, excluding the U.S. Wildfire Service, has an appropriation of $91,245,500.00 (₱375,-682,360.00) for the fiscal year 1958 alone, which is about 800 times as much as the average annual appropriation of the Parks and Wildlife Office.

Some of our leaders have subjected our national parks to political expediences at the sacrifice of public interest. The unsound practice of releasing and converting areas of national parks for purposes other than for which they are established, the trend to lop off big chunks of national park areas, and the absence of a permanent national park law, to safeguard the permanency of national parks, are basic problems which threaten to disintegrate or destroy our national park system in the Philippines. There is a necessity of a law which shall provide that a national park cannot be abolished or its area be reduced unless by Act of Congress.

The propensity of our people to appropriate unto themselves national park resources for personal gain, contributes greatly in aggravating the situation in our national parks.

Some people, without regard for the welfare of their fellowmen and the future generation, unlawfully enter national parks, cut down valuable trees for timber for commercial purposes. Many of our farmers make clearings (kaingins) inside national parks to raise crops for family consumption, or for commercial purposes. Still, there are many others who squat in national parks and later petition the government to release the area squatted by them. These are socio-economic problems which also affect our national parks.

Most of our national parks are not adequately manned to patrol and protect their resources from vandalism. The seeming toleration of the illegal activities in the national parks, as a result of our handicap to employ the necessary and qualified park officials to go after timber smugglers, squatters, kaingineros and other infractors — due to insufficient appropriation — are oftentimes taken for granted by the unscrupulous. Due to lack of parks personnel, necessary funds and appropriate equipment, national parks improvements, like recreational and public service and facilities to make the national parks useful and enjoyable, are not fully undertaken.

One more important problem is the absence of an effective and dynamic information and interpretation service, provided with complete equipment to produce appropriate informative and interpretive materials that will make known what we have in our national parks. A strong information and interpretation service is an important phase in national parks maintenance, that must go side by side with other activities in the administration of national parks, to keep the public informed of the values and of the progress of our national parks. The natural wonders and volcanic phenomena, which abound in our national parks, must be made known to the people, so that they will be appreciated and the people will take pride in them. Same must be made known abroad to attract tourists. With the increasing interest in travel throughout the world, it is imperative and important that we make known our national parks resources to the tourists so that our government could have a fair share in the tourists' dollars. To achieve this end, we need an effective information and interpretation service that will produce informative and interpretive materials on our national parks and wage campaign, not only to sell our national parks, but also to make the people rally behind our efforts to conserve them.

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TAPPING, COLLECTION . . . .
(*Continued from page* 40)

mentation of present rules and regulations governing tapping be instituted immediately. Licensees and tappers should be required to correct unscientific or crude methods of tapping and harvesting of almaciga resin in order to prolong the healthy life of the tree. It is not farfetched to predict that, left uncorrected or tolerated, these malpractices may totally ruin the almaciga resin industry, one of the nation's dollar-earning industries.

UTILIZATION OF THE . . .
(*Continued from page* 42)

A continued and sustained research work on wood, therefore, would unravel vast opportunities and new horizons in the utilization of our Philippine woods, which all industries using wood as raw material and the nation can profit from in the years to come.

# *Speech Delivered on Nov. 11, 1963 by Radio Regional Forestry Director Jose R. Claveria over Radio Station-DZJW, Zamboanga City on the Occasion of his Assumption to Office*

MY GOOD FRIENDS OF THE RADIO AUDIENCE:

This is indeed a happy occasion to speak to you and a very propitous time for me to tell you that effective July 5, 1961, the Office of the Regional Forestry Director for Region No. 7 has been established in the "City of Flowers"—Zamboanga City—with yours truly as its Acting Regional Director.

Region No. 7 includes 6 provinces—Occidental Misamis, Lanao del Norte, Zamboanga del Norte, Zamboanga del Sur, and the Sulu Archipelago—and 5 big cities—Basilan City, Iligan City, Marawi City and Zamboanga City. This region is comprised within the most populated portion of Mindanao and Sulu, the promised land so called of the South. It has an aggregate area of about 2,844,010 hectares and a huge population of about 2,414,744 people. Of the total land area, about 1,501,445 hectares are forest land with an estimated forest wealth of ₱150,000,000.00 in standing timber.

As the incumbent Regional Forestry Director, I feel exceedingly happy and fortunate to have been chosen to guide the forestry activities in this region because I know I can count with the full and unstinted support of all the people, more so of the officials and political leaders, upon whose support will greatly depend the proper implementation of our forestry policies and practices to achieve its ultimate goal of making our forest yield a continuous benefit to the country and people at all times.

When Reorganization Plan 30-A will have been fully implemented the Regional Office will function with an Assistant Regional Director and 7 staff officers to represent the different Divisions of the Bureau of Forestry, namely: Domain Use, Forest Land Uses, Forest Management Accounting. It will normally function thru the different Forest Districts and the Administrative, Scaling and Management Stations located strategically within the Region. Forest policies and the regular operating procedures will remain the same except that in cases or matters which could be decided by the Regional Director will be so decided, or finally acted upon in the Regional Office, thus the backlog and red tape of centralized administration in Manila will be minimized. Forestry users who, in the past, had to make an expensive trip to Manila will only travel to the Regional Office. It can safely be said, therefore, that the Regional Office will help bring about a faster and more efficient service to the people of the region, at the same time all forestry activities will be fully coordinated and supervised for maximum efficiency.

At this juncture, I wish to make of public information that all forest users and others interested in the affairs of the Bureau of Forestry to please, without any hesitation, bring their problems to the attention of the Regional Forestry Director. I can assure you that with the limited facilities and personnel of the Region we will try our utmost to help you solve your problems judiciously and in the shortest time possible.

It is indeed incumbent upon each full blooded Filipino, patriotic enough to be able to see and feel seriously concerned with the bold writings in the wall that conserving our Natural Resources...the forest especially...is the pressing problem of the time which needs everybody's support.

The days have certainly gone when we complacently think that we have vast, fabulous, magnificent and inexhaustible forest. For according to statistics we are far below the world's average of per capita forest cover of 1.6 hectares because our per capita forest cover of 0.56 hectare is alarmingly low. We belong to the eight lowest countries with Pakistan's 0.04 hectares as the lowest! Perhaps the above superlatives describing the conditions of our forest were true when Manila was merely under a barrio category and that the Filipino people did not so rapidly multiply that populous communities mushroomed in all habitable nooks and corners of the country! Certainly the advent of wood using industries and the accelerated needs of the people for wood materials and the nefarious activities of the fly-by-night loggers enhanced, one way or another, the wanton destruction of our forest wealth, which destruction was noted by a famous American forest authority, Mr. Tom Gill, when he said "You are destroying your forest faster than any country in the world". Added to these factors of decimating our forest is the unabated destructive activities of the squatter-kaingineros, which is the single factor in bringing about no less than 5.000.000 hectares of unproductive and denuded cogonal areas today!

It is needless to speak here about the sad and bitter sufferings and experiences of people in countries devoid of forest like Africa, China, India, Pakistan, Mexico, to mention only a few. Right here in our own country we are actually experiencing the devastating ravages of floods in Central Luzon and the shortage of water to run our hydroelectric plants. The recurrent brownouts in the big cities of Manila, Quezon and Pasay are the results of low water pressure in the Ambuklao and Binga power plants. Also in our own water system in the "City of Flowers", only a slight rain in the area makes the water muddy. This is all the result of denuded conditions of the watersheds that feed these power plants and the local water system in Zamboanga City. All the occurrences are bold warnings of the dangers ahead should we continue to feel indifferent to the Government forest conservation policies.

It is a well known fact too that forest keeps the equilibrium of nature for any successful venture in Agriculture. And because the economy of the country is purely agriculture, it being the the main source of the national income and from statistics about 2/3 of the gainfully employed Filipinos derive their income therefrom, a layman can readily see or imagine the magnitude and tremendous influence of the forest to agriculture. For if the forest is removed the ideal pattern of rainfall is disturbed and so with water supply which is the lifeblood of agriculture. The 5.7 million hectares of agricultural land, distributed to about 1.6 million farms averaging 3.19 hectares per farm will certainly become water thirsty and unproductive land if the equilibrium of nature is disturbed by unabated forest destruction.

So you now can see very clearly that one of the pressing needs of the country today is "Forest Conservation". And this is not merely the concern of a handful of Filipinos, the foresters and other equally responsible officials from the President down, but every civic minded and patriotic citizen. No one can successfully detach himself from the beneficial influence of forest because even the society matrons, the funseekers and big business executives, in our big populous cities suffer the inconveniences occasioned by the lack of electric power and adequate water supply. No one can say that he is very far from the forest and therefore, he is not interested. But whether we know it

(*Continued on page* 136)

# Forestry in the News

## FORESTRY SUBJECTS FAVORED

The inclusion of forest conservation subjects as required courses in high schools and colleges was favored by Jose Viado, reforestation administrator.

He spoke during the tree planting day at the bureau of customs.

Viado said that young minds grow up in ignorance of the importance of forestry and its conservation. The result is that the new generation do not realize the value of protecting trees.

Under the present program, forestry subjects are supplementary readings only, Viado said.

He also lauded Customs Commissioner Jose B. Lingad for initiating a drive against overshipment of logs to foreign countries.

(*Manila Times* — January 12, 1964)

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## WOOD PRODUCERS RALLIED

Competition faced in the world market by processed wood products from the Philippines must be approached as a common problem by processors of wood products in our country.

This was urged yesterday by Rafael C. Aquino, a trade leader and business executive from Sorsogon and Agusan, as he underscored the problem as vital and must be solved by Philippine wood processors if they have to perhand in the world market."

Aquino said that local processors must find a common leverage against stiff competition from other sources of processed wood products since the Philippines is a big supplier of raw materials for wood processing industries in other parts of the world.

Since the tendency for full utilization of wood products is to cut down on wood raw materials for export and expand processing industries, proper treatment of the problem of stiff competition in the world market from outside sources must be made as a common undertaking by leaders of processing industry in the Philippines, Aquino pointed out.

Aquino is president of several enterprises bearing his name and engaged in wood industries and import and export.

(*Manila Times* — December 18, 1963)

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## NEW FORESTRY CHIEF SETS 1964 PROGRAM

Acting Forestry Director Apolonio F. Rivera exhorted bureau officials and employees to redouble their efforts in 1964 to speed up effective protection, wise conservation and productive utilization of the country's forest resources.

In his staff meeting for the new year held Thursday, Rivera said it was imperative for all forestry employees to present a united front in disproving the public impression that there was something wrong with the agency and its personnel.

He would not inquire, he added, into what his predecessors had done and had not done. With the support of employees and forestry users, he would try his very best to improve further the public image of the bureau and extend to the people it serves the kind of pubic service they deserve, he said.

(*Mania Times* — January 12, 1964)

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## BERNAL'S RELIEF ASSAILED

Officers of the lumber industry yesterday assailed Malacañang for the unprecedented reshuffling of directors in the bureau of forestry.

Reacting with surprise and disappointment, representatives of two lumber blocs charged that Malacañang was trifling with a key bureau in the government responsible for supervising the forest resources of the country that now rank second as a dollar earner.

The sudden relief of Estanislao Bernal as acting forestry director in the midst of his aggressive campaign against racketeering subordinates and unscrupulous timber concessionaires dampened the enthusiasm of rank-and-file career men and compounded the confusion in the lumber industry.

In an industry where individuals can become overnight millionaires, the position of a forestry director is greatly sensitive to outside pressure.

Bernal was relieved while he was on his seven-month tenure in the bureau. Malacañang did not explain why he was being ousted.

His temporary replacement is Apolonio F. Rivera who was installed 16 days ago as undersecretary of labor. The Malacañang release did not state if Rivera will head the forestry bureau in a concurrent capacity.

Rivera will be the fifth acting director in 19 months.

Previous directors were Tiburcio Serevo, Mateo Pecson, Esteban Piczon and Bernal.

Bernal, who was pulled out of his innocuous job as assistant executive secretary in Malacañang to streamline the bureau, was considered "the best outsider director" by career and technical men in the bureau.

Before his relief, Bernal had succeeded, or was in the processing of accomplishing the following:

1. Ordered the cancellation of all special timber licenses in communal forests in Cagayan province due to illegal operations.

2. Banned the illegal practice of overcutting timber in licensed areas. About 430 timber license holders were affected.

3. Ordered the scaling of logs right in the cutting areas.

4. Conducted a delimitation of the country's unclassified lands in 13 provinces. The first massive survey will determine the approximate land and forest riches.

5. Set Dec. 31, 1963, as the target date for completing the drafts of proclamations of all definitely classified timberlands as forest reserves to speed up the stabilization of the status of permanency of forested areas.

In his order revoking timber licenses, Bernal said the holders had cut below the diameter limit stated in the license and outside the specified area or cutting the trees that had not been marked by forest officers.

(*Manila Times* — December 22, 1963)

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## RP LUMBER EXPORTERS HIT INT'L SHIPPING LINE

Philippine lumber exporters to the United States and Canada yesterday complained that the Association of International Shipping Lines Inc. was charging discriminatory freight rates that favored Japanese shippers.

Antonio de las Alas, president of the Philippine Lumber Producers' Association, said high freight rates to America and Canada make it difficult for Philippine shippers to compete with the Japanese.

The high rates had been the cause of the "stagnation of our lumber export to the US" and delayed the industrialization of the lumber industry, he said.

De las Alas took up the cudgels for three lumber companies in the Philippines which represent 75 per cent of all local lumber cargo exported to the US and Canada.

Two rate structures cited by the PLPA follow:
First case (for every 1000 bd. feet):

| | |
|---|---|
| RP lumber | $47.50 |
| Japan plywood | $20.00 |
| Difference | $17.50 |
| | (or 50 per cent) |

Second case:

| | |
|---|---|
| RP lumber | $47.50 |
| Japan plywood | $20.00 |
| Difference | $27.50 |
| | (or 138 per cent) |

De las Alas said there is a need for a reasonable reduction of the rates on lumber shipments to afford local exporters adequate protection against competition in the market.

The Philippine lumber shipper has no tariff advantage on entry to the US since there is no *ad valorem* duty on lumber, he said.

Japanese shipper also enjoys two additional advantages over the Philippine shippers. Stevedoring fees are charged to the shipper's account on the Philippines. The Japanese shipper is free from this responsibility.

The PLPA said Japanese manufacturers operate in the vicinity of major ports and can ship lumber without a maximum ceiling. Philippine shippers have to accumulate enough cargo (200,000 board feet) before it can ship it. The effect is that the Japanese shipper has no difficulty in getting direct space for small cargo.

(*Manila Times* — December 12, 1963)

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## REFORESTATION WORK PROGRESS REPORTED

Administrator Jose Viado of the Reforestation Administration announced recently that from July to November, 1963, the government has reforested more than 20,000 hectares with forest trees.

The administrator said this accomplishment has a five per cent improvement over that of the last fiscal year which saw the agency replenish only 19,000 hectares with forest trees.

The best justification for this hiked production, he said, was the unqualified support for reforestation extended by the present administration which invested more money in forest reclamation program and passed laws curbing forest destruction.

Considering the upward trend of the agency's reforestation activities, the government will easily make its goal of 45,000 hectares of reforested areas at the close of the fiscal year, Viado said.

He suggested that to arrest any misconceptions about the forest conservation efforts of the government, a nationwide forestry information campaign backed by a well oiled organization should be launched immediately.

(*Manila Times*—Dec. 16, 1963)

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## ZAMBOANGA PROJECT SET

The government will reforest a denuded cogonal area owned by private landowners in Zamboanga City if the title holders agree.

This was bared Thursday by Jose Viado, reforestation administration, as his agency swung into high gear its reforestation operations for 1964-65.

The area involved is a 150-kilometer long cogonal land along the national highway in Zamboanga totalling 25,000 hectares.

The idle lands could be reforested by the government which will then share from profits from the sale of forest products with the private landowners.

(*Sunday Times*—Dec. 16, 1963)

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## REFORESTATION PROGRAM

The reforestation program for 1964 will provide financial returns to the government, Administrator Jose Viado said.

The program also underscored cooperative forest reclamation work culminating in the production of community and village forests out of which the local inhabitants will draw their timber needs and other raw materials for local industries and other allied enterprises.

The cooperative planting effort will create job opportunities for the unemployed and eventually hike food production he said.

The administrator directed the technical services division to give emphasis on studies and experiments to hasten the reforestation of denuded mountains.

Viado said the ground work for setting up production projects has already been laid out with Mindanao as the pilot area. Mindanao will have its barren areas planted to rubber, cinchona, lumbang, benguet pines, and other raw-material producing trees.

(*Manila Times*—Feb. 2, 1964)

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## FORESTRY CHIEF BRIEFS MEN

Acting Forestry Director Apolonio F. Rivera assured the bureau employes in a general meeting held the other day that he would also look after the welfare of the agency's workers.

Rivera said complaints against forestry employes should be properly signed, subscribed and supported by evidence to warrant formal investigation. He scored the fact that more often than not complaints especially those which are unsigned, fictitious and not under oath are intended merely to harass and embarrass the employes.

Rivera made it clear, however, that he would not spare the rod on any erring forestry employes if the evidence establishes his guilt.

The forestry director, who is still concurrently undersecretary of labor and recipient of two presidential citations for honesty and integrity, has introduced a new approach on the maintenance of a closer working relationship among forestry officials and employes. Rivera said he would meet regularly not only his advisory staff composed of high ranking officials but also the rank and file employees.

Rivera also announced that the bureau would soon launch a massive information drive designed to enlist public support and cooperation in forest protections and conservation program.

He instructed Amador J. Evangelista, bureau information chief, to prepare the program for immediate implementation in coordination with other forestry agencies, regional directors and district foresters throughout the country. The result of the drive, Rivera said, would largely determine the fate of the forest conservation program.

(*Manila Times*—Feb. 2, 1964)

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## FORESTRY BOSS FIGHTS BRUSH FIRE ON KENNON

Apolonio F. Rivera, acting director of forestry, Friday evening fought a brush fire which could have developed into a big forest fire along Kennon road.

Rivera was on his way up to Baguio on his first official visit to this city since his appointment as forestry director.

Near Camp 3, Rivera noticed that a fire had just started by the roadside. With forestry information chief Amador Evangelista and Luisito V. Medrano Jr., his driver, Rivera put out the fire by beating it with twigs.

Had the party been passing by a few minutes later, the fire could have spread towards the pine forest and the blaze would have been hard to control.

Rivera conferred with district forester Deogracias A. Juni and his staff. During the meeting he disclosed his program to accelerate action on forest protection and conservation.

Accompanied by Mayor Norberto F. de Guzman, Judge Guillermo B. Guevarra and Juni, the forestry director also inspected the Baguio watershed at Ambiong, which is the site of frequent forest fires during the dry months.

### MINERS' CONTRACT

A collective bargaining agreement was signed by the Itogon Suyoc Mines, Inc. and the Itogon Labor Union-PAFLU, providing for fringe additional benefits to employes and workers of the mine.

The bargaining contract took effect last Jan. 1, and will last for 2½ years.

The agreement was signed by officials of the mining company headed by Sen. Gaudencio Antonino, president; and officers of the union led by Fortunato Estras, president.

(*Manila Times*—Feb. 4, 1964)

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## FORESTRY PRESSES CLASSIFYING JOB

Forestry Director Estanislao R. Bernal said that the land classification work of the bureau has already reached the point where the great bulk of the arable land of the country which is now actually settled and occupied has already been classified.

Bernal said in Cavite, Rizal, Batangas and Laguna where lands have already been settled since many centuries back but have remained unclassified, classification work will be undertaken immediately. Those which are titled and agriculturally developed will be released while those needed for forest purposes, watershed protection and grazing will be retained.

The forestry director announced that land classification work and the establishment of permanent forests will continue in the different parts of the country until all available agricultural, residential, commercial and industrial lands not exceeding 50 percent of the whole area of the Philippines would be released as not needed for forest purposes and the remaining 42 per cent demarcated as timber lands.

As of June 30, 1963, 12,317,997 hectares or 41.42 per cent of the total land area of the Philippines have been classified and certifi,ed as disposable or alienable and 7,314,141 hectares or 24.29 percent have been delimited for forest purposes.

Bernal said 100 parcels of forest reserves with an aggregate area of 1,140,285 hectares were maintained last year. There were also 2,085 parcels of commercial forests involving 234,876.76 hectares.

(*Manila Times*—Oct. 14, 1963)

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## RA OFFERS TO REFOREST ILOCOS NORTE SAND DUNES

The Reforestation Administration has offered to reclaim a vast area of dunes in Ilocos Norte, and to restock it with forest trees to restore it to its original potential.

The proposal was made by RA Chief Jose Viado in separate communications to the bureau of soils and the provincial government of Ilocos Norte.

Viado said that the government is willing to reforest about 1,500 hectares of sand dunes found mostly in Laoag, Paoay and Badoc, either as a sole responsibility of the Reforestation Administration or as a joint venture with the Ilocos Norte provincial government.

However, before the proposed reclamation work is started, the bureau of forestry's administrative jurisdiction over the areas suggested for reforestation should first be transferred to the Reforestation Administration, Viado said.

The corners and boundaries of sand dunes inside Ilocos Norte's forest reserve should also be marked and traced so that all persons found squatting on the proposed areas will be ejected before any planting is done, he explained.

The Ilocos Norte "desert" may be reforested with agoho trees or bitaog, talisay, madre de cacao, and ipil-ipil.

The Reforestation Administration is ready to prepare a 10-year working plan, Viado said.

Success of the project will not only give Ilocos Norte more productive lands, but also protection against wind-borne sand that settles on fertile farms, eventually rendering them impotent, he concluded.

(*Manila Times*—Jan. 14, 1964)

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## VIADO SEEKS ₱9.5 M

The Reforestation Administration is asking ₱9.5 million to finance its activities for the next fiscal year starting July, it was learned from Administrator Jose Viado.

He said reclamation of the more than 1.4 million hectares of naked forest lands within a relatively shorter period was necessary "to avert any economic tragedy that might befall the country as a result of deforestation."

Under the proposed budget, more reforestation projects will be established because the existing 62 schemes are too few to fully take care of the forest reclamation needs of the Philippines, Viado added.

He said that for the fiscal year ending June, 1963, his agency:

"1. Employed more than 41,000 workers in the various reforestation projects, thereby helping solve the acute unemployment problem of the country as well as alleviating the plight of many a jobless citizen.

"2. Reforested more than 35,000 hectares of denuded forest lands.

"3. Increased its six original reforestation regions to eight, thus affecting a more closely knit and meticulously supervised reforestation work.

"4. Intensified its cooperative planting activities, silvicultural research projects, and reforestation extension campaigns."

(*Sunday Times*—Feb. 9, 1964)

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## FOREST SLOGAN TILT ON

The forest conservation slogan contest has aroused nationwide response from all over the country, it was learned from the Society of Filipino Foresters which is sponsoring the contest.

At stake are two ₱500 first prizes donated by the Philippine Lumber Producers' Association and the Philippine Chamber of Wood Industries, two ₱300 second prizes from the Plywood Manufacturers Association of the Philippines and the Philippine Association for Permanent Forests, and two ₱100 third prizes from the Forestry Alumni Association and the Forestry Faculty Club.

The contest is intended to produce dynamic slogans which will be used to spark a national forestry movement. The slogan should not be more than 12 words and could be either in English or Pilipino. The theme should be on conservation of forests, encouraging reforestation, appreciation of trees, promotion of wood industry, role of forests in the life of the people.

Entries postmarked after February 29 will not be considered. All entries are to be addressed to Society of Filipino Foresters, P.O. Box 2121, Manila.

(*Sunday Times*—Feb. 9, 1964)

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*Available*

## TOP UP WOOD GRADS LOOKING FOR JOBS

Five specially trained, young men and women will soon be available for employment in the wood using industry, Rodolfo C. Yaptenco, head of the Forest Utilization Engineering department, announced yesterday.

"These young men and women represent the best of fifty of the first class in wood utilization engineering at the UP College of Forestry, Los Baños, Laguna, who will graduate May 1964. They know forest utilization engineering thoroughly and can apply their knowledge readily. They have field experience in private lumber plants. They have chosen wood utilization engineering as their lifetime career," Yaptenco said.

The young graduates will be: Cenon M. Castillo, Rogelio de la Rosa, Virgilio Fernandez, Ester Vergara and Francisco Clemente.

According to Yaptenco, the graduates are trained to meet special demands for our lumber industries. This is a great advantage. For their training is a result of an actual study of the needs of wood users and their curriculum is designed to meet these needs.

Caesar Recto, secretary of the UP College of Forestry, said that the 2nd utilization class will begin by July 1964. Applications for registration are now being taken.

Meanwhile, the UP College of Forestry is now making a cooperative effort to introduce new courses on quality control and wood utilization research in forest utilization engineering with private lumber industry.

"This is to meet the acute need of Philippine lumber industries for technicians and wood product engineers in the production of better and new wood products," said Yaptenco.

The college has presented its program for examination and evaluation to lumber industries in a conference of lumbermen on the problems of wood using industries in Zamboanga. This curriculum seeks to train students along the more specialized lines of quality control in wood utilization engineering.

(*Manila Chronicle*—Feb. 12, 1964)

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## MORE RP PRODUCTION OF PLYWOOD URGED

An American furniture manufacturer said yesterday the Philippines should produce more plywood to meet "great demands" for the product in the United States.

Leo Seifer, president of Land B Products Corporation in New York, made the statement upon arrival here yesterday afternoon by PAL jet from Hongkong.

Seifer said he came to the Philippines to make arrangements for the purchase of plywood and locally-manufactured chairs for his clients in the U.S.

On the same plane was Colin H. MacCulloch, general manager of "Asia" magazine, who came to visit with friends.

Clarence L. Hulford, vice president of the National Bank of Commerce of Seattle, Washington, also came by PAL to confer with officials of the Philippine National Bank and his bank's other local correspondents.

John C. Haas, vice president of Rohm and Haas company in Philadelphia, arrived from Tokyo on a brief visit. Rohm and Haas Comypany is engaged in a joint venture with H. G. Henares and Sons, Inc.

The joint venture, according to Haas, included the manufacture of acrylic emulsions for the textile, paper, leather and paint industries, The company is named Arfil Chemical Corporation.

From Manila, Haas will proceed to Australia where his firm has other interests.

Andrew N. Overby, vice president of First Boston Corporation, planed in by Northwest Airlines Jet from Tokyo on a visit.

Overby had been deputy managing director of the International Monetary Fund and Assistant Secretary of the U.S. Treasury.

(*Manila Chronicle*—Feb. 11, 1964)

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## REFORESTATION OFFICE SEEKS ₱95-MILLION

The Reforestation Administration is asking ₱9.5 million to finance its intensified reforestation activities for the fiscal year 1964-1965, it was learned from Administrator Jose Viado.

He mentioned the necessity of reclaiming the more than 1.4 million hectares of naked forest lands within a relatively shorter period "to avert any economic tragedy that might befall the country as a result of deforestation" as the agency's most valid reason for requesting the financial outlay.

With the proposed budget, the Reforestation Administration will be able to implement a closely coordinated reforestation program throughout the country. More reforestation projects will be established because the existing 62 schemes are too few to fully take care of the forest reclamation needs of the Philippines, Viado explained.

He said that for the fiscal year ending June, 1963, his agency:

1. employed more than 41,000 workers in the various reforestation projects, thereby helping solve the acute unemployment problem of the country as well as alleviating the plight of many a jobless ciitzen;

2. reforested more than 35,000 hectares of denuded forest lands;

3. increased its six original reforestation regions to eight thus effecting a more closely knit and meticulously supervised reforestation work; and

4. intensified its cooperative planting activities, silvicultural research projects and reforestation extension campaigns.

The administrator stressed that ever since the Reforestation Administration became an independent entity three years ago, it has already restored over 62,000 hectares of barren watersheds to forest trees.

This upward trend in reforestation should not be allowed to bog down if only to keep the country's hopes for better economic living alive, he concluded.

(*Manila Chronicle*—Feb. 12, 1964)

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## FIRM INTRODUCES NOVEL PLYWOOD PRESERVATIVE

Renato Arevalo, executive vice president of Sta. Clara Lumber Co., Inc. announced yesterday the introduction of celcure-treated plywood into the Philippine market.

The lumber executive said celcure is a wood preservative consisting of water-soluble salts of copper and chronium which, after vacuum pressure impregnation, combines with lignin in the wood to form an insoluble compound once the plywood is dry.

The preservative remains in the wood even if it is immensed in water and provides protection against all forms of fungal attacks and wood borers such as "bukbok" and "anay," Arevalo said.

The celcure formula is patented by Celcure Ltd. of London, England.

(*Daily Mirror*—Nov. 27, 1963)

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## TREE-PLANTING IN STA. RITA

Public Works Secretary Brigido Valencia recently visited Sta. Rita, Pampanga and pledged full support to the beautification movement headed by civic-spirited citizens of the town.

Maj. Fernando E. Ricafort, chairman of the Sta. Rita Beautification Movement, told Valencia that his group will soon launch a massive program of tree-planting of all the provincial highways and municipal roads, using different species for every road to serve as street markers.

Among those invited to sponsor the tree planting are Gen. Alfredo Santos, AFP chief of staff; Gen. Carlos P. Romulo, UP President; Mrs. Luz B. Magsaysay and Agriculture Secretary Jose Feliciano.

All roads will be provided with concrete canals to improve the drainage. Mercury vapor lamps will be installed in and around the town proper.

(*Manila Times*—Nov. 21, 1963)

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## TO TRAIN ABROAD

Adolfo Decena, a junior forest products technologist and acting chief of the sawmill improvement section, industrial investigation division of the Forest Products Research Institute, University of the Philippines, will enplane tomorrow, Nov. 29, for Frankfurt, Germany where he will undergo technical training on lumber processing for 16 months.

This fellowship grant is being awarded by the Federal Republic of Germany in cooperation with the government of Saarland.

Decena, who performs sawmilling research at the UP FPRI, is the son of Mr. and Mrs. Jacinto Decena of Iligan City, Lanao del Norte.

(*Daily Mirror*—Nov. 28, 1963)

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## WOOD CHAMBER HOLDS MEET TODAY

The Philippine Chamber of Wood Industries holds its annual general meeting and elections today at the Carbungco's Restaurant on Quezon Boulevard Ext., Quezon City.

Valeriano C. Bueno, PCWI president, announced main items on agenda are the following:

1. Report of the PCWI president;

2. Bill pending in the lower house of Congress defining by statue tenure and area of concessions;

3. Tenure of public officials as they affect policy and regulatory measures which determine the progress of business and industry;

4. Steps toward the stabilization of the log trade between Japan and the Philippines;

5. Assessment of the needs of processing in the country as they affect log exportation;

6.Consideration of tax measures and tariff amendments that affect the wood industries and their growth; and,

7. Election of officials and members of the chamber's board of directors.

Chamber officials unanimously feel there is urgent need for clear-cut, definite and stable policy on utilization of forest resources, establishment of processing industries using wood as raw material, and taxation as they promote expansion and diversification of production.

The same officials explained such a definite approach to policy-making will have to consider credit money, fiscal spending and taxation in the light of the needs of an expanding wood industries in the country.

(*Manila Chronicle*—Jan. 29, 1964)

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## PROBLEMS ON PAPER PULP MAKING CITED

Lack of raw materials, lack of domestic capital, and the high cost of imported pulp are the main problems of the local pulp and paper industry today, according to Assistant Director Francisco N. Tamolang of the Forest Products Research Institute.

Tamolang spoke in a symposium on agriculture at the National Science Development Board pavilion held as part of the Science Week celebration.

The Forest Products Research Institute in College, Laguna, is now conducting intensive studies in its chemical laboratories on paper and pulp-making with the use of local fibrous materials, Tamolang said.

Its findings, he disclosed, show that the Philippines abounds with both commercial and non-commercial wood species that produce quality paper. Three of these species, *lanipau, toog,* and *tuai,* exceed US federal specifications for Grade B wrapping, he said.

The institute has provided technical training to 52 men and women in various fields including pulping and paper making, pulp and paper testing, pulp bleaching, and chemical analysis of wood, pulp, and paper, he continued.

Tamolang disclosed that the institute has initiated the establishment of a Southeast Asia Pulp and Paper Research Training Center to be set up in college and attached to the institute.

The center will accommodate local researchers and technicians, as well as those from Southeast Asia who will train in the basic sciences and technologies applicable to the pulp and paper industry.

(*Manila Times*—Dec. 8, 1963)

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## SYNTHETIC GLASS USES DEFINED

The Borden Chemical Company, USA, was a major supplier of synthetic resin glue to the Philippine plywood industry until 1957, when the plant of the local affiliate was completed and became the first to produce locally the urea-formaldehyde glues. At that time, there were 10 plywood plants, whereas a total of 21 plants will be in production during 1964. Not only has there been an increase in the number of plants, but the production facilities of a number of the old plants have been streamlined and equipped to increase their capacity. It could very well be that the plywood industry will consume 20,000,000 lbs. of glue in 1964.

### 2-Component System

The urea-formaldehyde glue is a two component system, the resin and the catalyst. The resin, by itself, has a certain amount of tack but cannot produce a permanent bond. When dissolved in water and a chemical reaction is promoted by the addition of a catalyst, a strong water resistant bond is obtained which, if the glue is used properly, will withstand greater stresses than the wood fibres surrounding the glue line.

The urea-formaldehyde resin, along with the phenolformaldehyde products, can be considered the forerunners of the present plastics industry with its many polymeric substances. In the layman's language, these products are the combination of two or more different molecules to form a heterogenous geometrical arrangement in three dimensions. The polymer chemist has learned how to promote these combinations and to stop the reaction in controlling the size of the polymer. In effect, the producer of the urea-formaldehyde resin combines these molecules to a certain stage suitable for use by the plywood manufacturer.

The manufacturer then makes his U-F glue mix and, with the addition of the catalyst, continues the reaction to completion after the glue has been spread on the veneer and the "sandwich" is pressed together. In this fashion, any number of veneers can be bonded together to form the common three, five, and even seven ply plywood panels, the

glue with its complex construction tieing together the adjacent fibres of one veneer to the other.

### Gluing Operation

The gluing operation is very simple, but care must be exercised in preparing and handling the resin-catalyst mixture. Catalyst compositions vary to suit the pressing conditions, the glue room temperature, the type of wood being used, and the assembly time. These same conditions are affected also by the amount of catalyst used. A hot press resin catalyst combination cannot be used if the pressing operation must be done at room temperature or a wrong addition of catalyst could set the glue mix before there is time to place the "sandwich" in the press. The moisture content of the wood is a factor, also, particularly when the hot press operation is used—if too dry, the wood draws the glue away from the joint to produce a starved glue line and, if too moist, excessive moisture in the form of steam may collect in pockets to prevent any bond.

(*Manila Times*—Jan. 14, 1964)

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## FOREST CONSERVATION POLICY PLEDGED

Lorenzo Sarmiento, president of the Philippine Chamber of Wood Industries, said yesterday the chamber would pursue an active policy of conserving and wise utilization of the country's forest resources.

In an organizational meeting held at the Penhouse yesterday, Sarmiento pointed out that protection of our existing forest resources can be made effective through:

1. Practice of sustained yield management through the selective logging method.

2. Appointment of more concession guards to protect permanent timberlands from Kaiñgineros, squatters and illegal loggers; and

3. Wider dissemination of information of the value of forest resources to the future economic health of the country.

To make the work of the chamber in line with its objectives chairmen of standing committees were appointed by the board as follows:

Gaudencio S. Mañalac, information and public relations; Teodoro Araneta and Jose Puyat, Jr., finance; Rosauro P. Dongallo, membership; Claro M. Yancha, government relations; Lorenzo Sarmiento, congressional matters; David Puzon, labor-management relations; Jose E. de la Rosa, local affairs; Florencio Tamesis, wood processing development and research; Valeriano Bueno, Jorge Tirador, Felipe Buencamino, Arturo Say, Teodoro Juliano, Quirino Gonzales, Augusto G. Gamboa and Lupicinio Campos, economic and trade missions; and Teodoro Araneta, forestry matters.

The officers and members of the board of the PCWI for 1965 as as follows: Lorenzo Sarmiento, president; Rosauro P. Dongallo, executive vice president for Northern Luzon; Augusto G. Gamboa, vice president for Manila; Felipe Buencamino, vice president for Southern Luzon; Claro M. Yancha, vice president for Visayas; Gaudencio S. Mañalac, vice president for Mindanao; Teodoro Juliano, Jose Puyat, Jr., Arturo Say, Florencio Tamesis, Quirino Gonzales, Lupicinio Campos, Jorge Tirador, and Jose E. de la Rosa, directors.

(*Manila Chronicle*—Feb. 3, 1964)

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## FIRE CREW ORGANIZED IN BENGUET

The Bobok timber project of the Benguet Consolidated, Inc., recently organized an 18-man firefighting crew to contend with the forest fires during the current dry season in Bobok, Bokod, Benguet, Mt Province.

The Bobok firefighting crew, first of its kind in this forestry district, is jointly headed by Timoteo Lagasca and Benjamin Boncato.

Boncato said that the firefighting crew is on a 24-hour alert daily, and is ready to go into action whenever fire breaks out in the area. It has its own fire lookout system.

Boncato reported to district forester Deogracias A. Juni last Friday that he filed a complaint against Ingway Owase, an Igorot kaiñginero, with the justice of the peace court in Bokod, Benguet, for allegedly setting fire to the public forest in barrio Pito, that municipality.

(*Manila Times*—Jan. 24, 1964)

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## SEPARATE ENTITY

*Dear Editor*:

The picture entitled "Land Reform Group" accompanying the article "Taiwan land reform team visits Bulacan area today" which appeared in the Manila Times ot Jan. 6, showed the Taiwan team and UP Vice President and Dean Dioscoro L. Uma-

li viewing the paper samples in the air-conditioned paper testing room of the Forest Products Research Institute at College, Laguna, which they visited last Sunday, Jan. 5.

It seems that there is a growing notion that the Forest Products Research Institute is just a part or rather a research laboratory of either the UP College of Agriculture, College of Forestry, or the International Rice Research Institute (IRRI). For the information of the general public, we were once a division of the bureau of forestry but the approval and subsequent implementation of Reorganization Plan No. 77 by Executive Order No. 257, dated July 5, 1957, established the Forest Products Research Institute as a separate entity, semi-autonomous in nature and totally independent from the UP College of Agriculture and Forestry, although all are under the University of the Philippines.

The FPRI has no financial or administrative connection whatsoever with the IRRI. Both research institutions are independent of each other and are working on different lines of studies.—*Corazon L. Bondoc, Publication and Information Office, FPRI.*

(*Manila Times*—Jan. 21, 1964)

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*It's in the name*

## RP WOOD PRODUCTS FACE TOUGH FIGHT

Philippine mahogany is facing the most serious threat to its dominant position in the US market since it was first introduced commercially in that country in 1904.

Importers of rival wood products also using "mahogany" as a trade mark are seeking legislative action to prevent the Philippines from identifying its own wood products by that name, Henry S. Thompson, president of the Philippine Mahogany Association of the United States, said Wednesday.

Thompson held a press conference together with Antonio de las Alas, president of the Philippine Lumber Producers Association, to stress the importance of the Philippines retaining its right to use the term "mahogany" for its wood products.

Since pre-war years there have been attempts, through the courts and the executive department to exclude the Philippines from the use of mahogany as a trade name.

The filing of a bill to that effect in the US Congress, however, is considered the most serious attempt yet and is interpreted as a last ditch to move to scuttle the popularity of Philippine wood products in the US.

The bill seeks an amendment to the Federal Trade Commission Act which would in effect limit the use of mahogany to identify only certain species of woods coming from Africa and the Americas.

Philippine mahogany represents 99 per cent of the more than $100 million worth of wood products exported by the Philippines annually. The third largest dollar earner of the country, over 50 per cent of these exported wood products find their way to the US.

Significance has been attached to the renewed efforts to limit the use of the term "mahogany" considering that 69 per cent of the logs and lumber in the US designated as mahogany comes from the Philippines. The figure does not include large quantities of wood in the US imported from the same source in the form of pywood and veneers.

Thompson, who is also president of the Insular Lumber Sales Corporation in Negros Occ., said the bill seeks a limit to the use of "mahogany" as a trade name on the basis of botanical classification.

The argument, he said, is that botanically speaking, only certain species of wood from Africa and the Americas can be truly classified as "mahogany."

Sponsors of the bill, he said, also argue that since Philippine wood products are popular in their trade name would not affect their quality and position in the market.

The Philippine Mahogany Association, however, pointed out that since its introduction in the US market, Philippine wood products have always been known as "mahogany" and have developed their popularity under that identity.

It also pointed to the observation of American botanist that "mahogany" should be used in terms of commercial acceptance and public understanding.

The basis for the stand of the botanists, Thompson explained, is that it strictly defined, mahogany would only apply to the species that grow in America.

In that respect, Thompson pointed out, Africa would have as little right as the Philippines to use the name "mahogany."

(*Manila Times*—Nov. 22, 1963)

* * *

*'Lumberman of the year'*

## ALCANTARA PRODUCTS ARE WIDELY ACCEPTED ABROAD

Conrado C. Alcantara, BWAP's 1963 "Lumberman of the Year," was born in February 19, 1913 in Malibay, Pasay City.

He is the only son of the late Fulgencio Alcantara and Esperanza de la Cruz of the same city.

He is a commerce graduate of the Far Eastern University.

A man of varied activities, Alcantara is connected with a number of business firms and civic groups. He is the president and general manager of C. Alcantara & Sons, Inc., owners and operators of timber concessions located at Saug and Kamansa, Davao.

He is also the president of the Commercial Credit Corporation of Davao, president of the Davao Producers and Exporters Association, and president and general manager of the Sarangani Cattle Co., Inc.

At the same time, Alcantara is a member of the Davao Lions Club, vice president of the Davao Gulf and Country Club, director of the Chamber of Wood Industries, member of the Plywood Manufacturers Association of the Philippines and of the Philippine Chamber of Commerce.

C. Alcantara and Sons, Inc. is an exponent of the sustained yield and selective logging management implemented by the Bureau of Forestry.

It is the only firm which has complied with and lived up to the Forestry Administrative Order No. 11-13.

It is also the only company to have completed and began operation within two years of its grant of a 6,000 daily capacity veneer and plywood plant.

C. Alcantara and Sons has been acclaimed one of the most beautiful and modern wood processing mills in the Far East.

Its plywood products too, have been adjudged as most widely accepted in the US plywood market.

Besides manufacturing veneer and plywood, C. Alcantara and Sons, Inc. is also the owner and operator of a sawmill operating at Nabunturan, Davao.

The members of the Business Writers Association of the Philippines took these factors into consideration when they chose him "Lumberman of the Year."

Our awardee is married to the former Ladislawa Inquimboy of Kawit, Cavite. The couple has six children.

* * *

## MORE REFORESTATION WORK PLANNED IN EAST VISAYAS

An intensive drive to reforest eastern Visayas was launched recently by the Reforestation Administration with the proposed establishment of four new reforestation projects in the provinces of Cebu, Samar, and Leyte.

There are six existing reforestation projects located in Cebu, Bohol, Danao City, Tacloban City, Samar, and Negros Oriental.

The four proposed projects, according to administrator Jose Viado, cover an aggregated area of more than 23,000 hectares of denuded watersheds. About 17,000 hectares are found in Cebu, 4,512 in Samar, and 1,500 in Leyte, he said.

Cebu, one of the most deforested provinces in the Philippines will have three reforestation projects. Bohol and Samar will have two each.

The reforestation scheme shake-up is an offshoot of the many provincial and municipal resolutions brought to Viado's attention by forester Buenaventura Lim, reforestation regional supervisor for Eastern Visayas.

The proposed reclamation plan will be implemented immediately upon its approval by the DANR secretary, Viado said.

The proposal is expected to meet slight or no opposition because the whole country knows that it will help protect eastern Visayas from the ravages of floods, droughts, erosion, and crop failure, Viado concluded.

(*Manila Times*—Feb. 21, 1964)

* * *

## FOREST ENCROACHMENT BY PULP FIRM PROTESTED

A vigorous protest against the Araneta Enterprises now cutting trees in the forests of Kalinga for the firm's paper pulp factory in Cagayan has been registered by the Balbalan barrio council.

The protest came in the wake of reports that Balbalan barrio folk had threatened employes of the Araneta Enterprises with bodily harm if they did not stop cutting trees in their communal forest.

The brewing controversy between the Balbalan natives and the Araneta Enterprises was reported to have been touched off by the cutting of trees for the company's paper pulp factory in the communal forest of Balbalan, Kalinga.

Barrio Captain Alfredo Lunes and Pelagio Ngaya-an a barrio leader, appealed last week to Commissioner Gabriel Dunuan of the National Integration Commission for help to avert possible bloodshed in the disputed area.

In their letter to Dunuan, Lunes and Ngaya-an said that the Araneta Enterprises had "encroached into their communal forest," thus threatening the barrio's their water sources and eventually depriving the residents of their forest products through the cutting of tree in the region.

The two barrio leaders claimed that the forest now under concession by the Araneta Enterprises had been declared a communal property of the town of Balbalan by the bureau of forestry as far back as October 14, 1924.

The disputed forest region had been granted, according to bureau of forestry records, to the municipality of Balbalan as communal forest records to the municipality of Balbalan as a communal forest covering some 480 hectares.

Felix L. Aliado, CNI filed representative who conducted an investigation of the complaints of the Balbalan barrio residents, confirmed the grievances of the people in his report to Commissioner Dunuan.

Aliado said that cutting of trees by the Araneta Enterprises already had started within the communal forest region. Among the points he raised from the results of his findings:

1. The forest region now included in the Araneta Enterprises forest concessions is a communal forest declared by the forestry bureau in 1924.

2. The forts region is the source of a huge water supply which supplies all the rice terraces of some 12 barrios in the municipalities of Balbalan and Lubuagon in the subprovince of Kalinga.

3. This mountain forest, under concession to the Araneta Enterprises, cover a very wide area extending as far as the mountain regions of barrio Balbalasang on the Kalinga-Abra provincial boundary.

4. The Araneta concession was surveyed aerially hence the people were not aware that their communal forest was being encroached upon.

5. The people of Balbalan, when informed about a survey being conducted by the Araneta Enterprises, had made representations with the superintendent of the Araneta Institute, requesting it to desist from exploiting the same forest because it was their communal forest but the same enterprise continued with their survey work until the superintendent was forced to flee after being threatened by the people in the region.

6. The progress that the Araneta Enterprises would give to the people in the area will be "temporary" in nature and that through deforestation, their rice fields will dry up thus, affecting adversely the future livelihood of the people.

7. The people are "trying their best to preserve their water source."

Meanwhile, Dr. Salvador Araneta conferred with barrio officials and residents of Balbalan on the disputed forest region.

In their conference Araneta told the barrio folk that the Araneta Enterprises "will only cut the young trees intended for paper pulp" and that the 'people were misinformed about the paper pulp project."

Araneta suspended the tree-cutting operations in the area reportedly after being informed that his superintendent was almost lynched by the Balbalan folk for insisting on cutting trees in their communal forest.

(*Sunday Chronicle*—Feb 29, 1964)

* * *

## RIVERA WARNS LOGGERS

Forestry Director Apolonio F. Rivera urged bureau fieldmen to exercise vigilance against all forms of forest destruction as they constitute the main line of the government in the campaign to protect and conserve the country's natural wealth.

The forestry director who had been cited as the "best director the bureau of supply coordination ever had," adopted the policy of meeting regularly the rank and file of bureau employes to impress upon them the need of giving their very best in the success of the government forest conservation program.

He further announced that he would prescribe a uniform for forest guards so that they could be easily identified by the public.

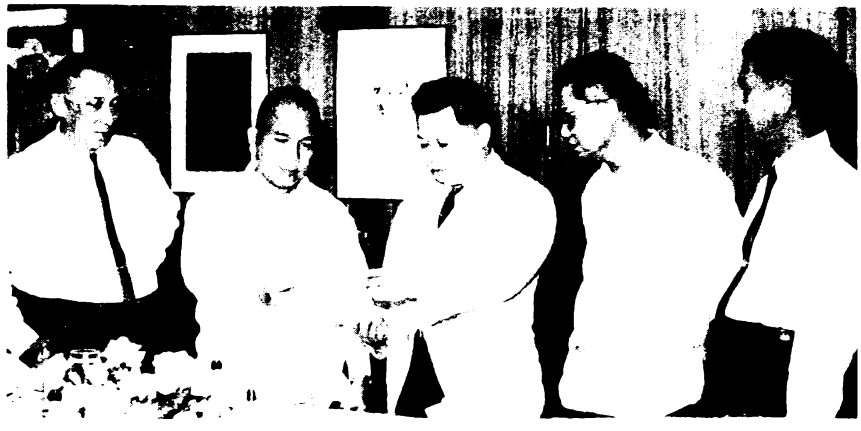
(*To be continued on page 120*)

# Here & There

FAO-NU DIRECTOR GENERAL WITH PHILIPPINE DELEGATION

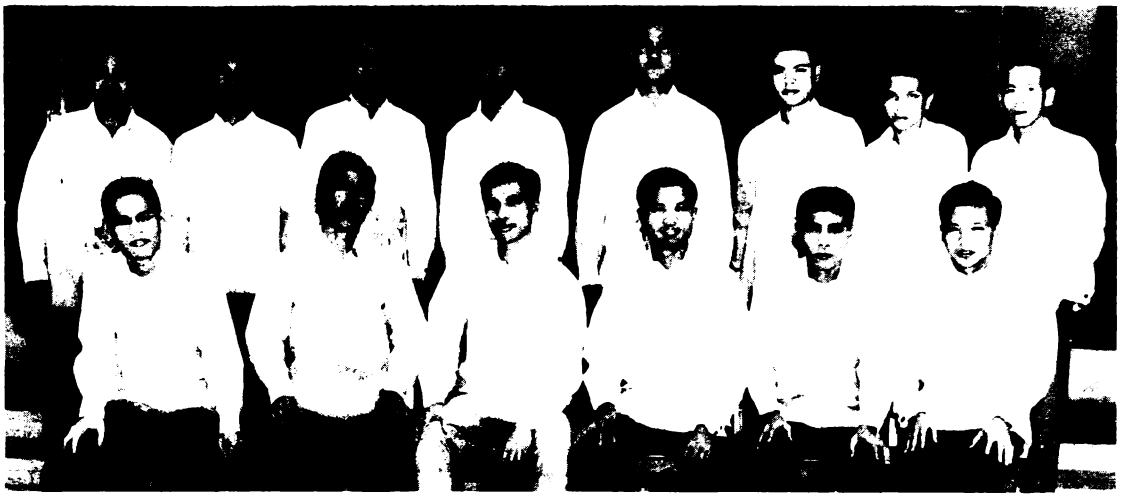
Director-General B. R. Sen (sixth from left) of the Food and Agriculture Organization of the United Nations posed with the Philippine delegation during the last 12th FAO Biennial Conference held from November 6 to December 6, 1963 at Rome, Italy. From l. to r.: Asst. Director Juan Utleg of Forestry; Chief Fernando de los Reyes of the Agricultural Information Division, DANR; Director Anacleto B. Coronel of Animal Industry; Director Manuel R. Monsalud of the Forest Products Research Institute; Mrs. B. R. Sen: Director-General Sen; Miss Lourdes Garabato, Executive Secretary of Philippine FAO Committee; Miss Feliciano; Mrs. Jose Y. Feliciano; Secretary Jose Y. Feliciano of the Department of Agriculutre and Natural Resources; and Director Eugenio E. Cruz of Plant Industry. Secretary Feliciano was the chief delegate while Director Monsalud acted as technical adviser to the chief delegate on forest products utilization.

Picture shows the conferees holding a session in the Office of the Dean, College of Forestry. From left to right clockwise, Director Monsalud, Dean Zamuco, Stenographer Santos Lantican of the FPRI, (partly hidden) and Prof. Webb.



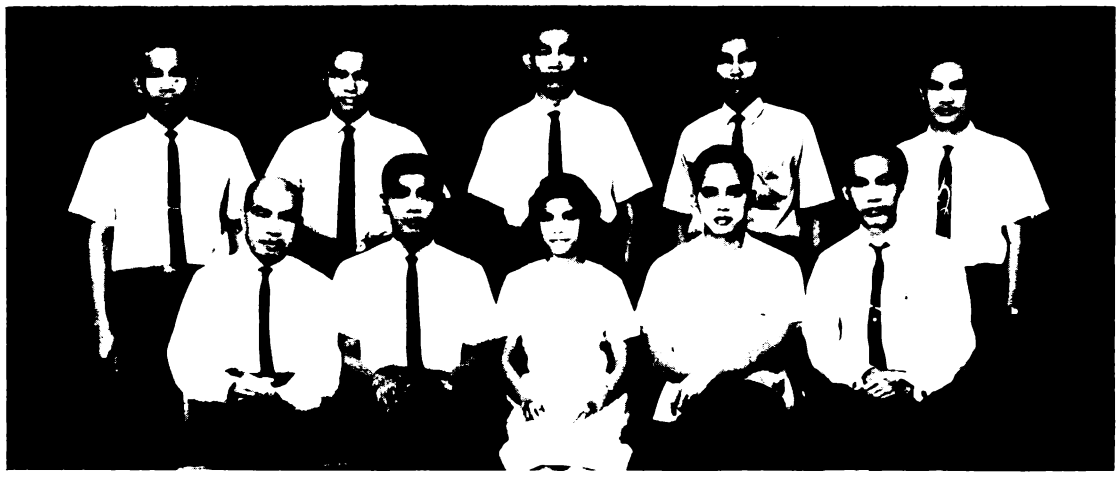
Director Manuel R. Monsalud (second from left) of the Forest Products Research Institute presents the survey report to Executive Vice President Renato Arevalo of the Sta. Clara Lumber Co., Inc. Witnessing the presentation are (from l. to r.): Mr. Ramos, comptroller of the company, Forester Dominador G. Faustino Sr., chief of the Industrial Investigations Division, FPRI and Engr. Aurelio C. Lagman, General Manager of the Sta. Clara Lumber Co., Inc.

President Macapagal with the Dean & the Faculty of the College of Forestry on Common Man's Day at Malacañang.



FSBO COUNCIL OFFICERS

Seated from (l to r): Lope D. Reves (Rep.): Florentino I. Ferrer (PRO); Modesto O. Canave (Pres.); Cresenciano Q. Dacumos; Teogenes T. Agbisit (Sec.); Andrew W. Bacdayan (FSBO Adviser).
Standing (l to r): Pedro C. Salazar; Diosdado Marfil; Primitivo C. Galinato (Ath. Mgr.); Francis S. Mabanag; Allen Torrenueva; Marcelino V. Dalmacio (Auditor); Jose A. Gonzales (Sgt.-at-Arms).



U.P. COLLEGE OF FORESTRY
Senior Class Officers—1963-64

*Standing L-R*s Jose A. Gonzales—Bus. Mgr.; Carlos L. Wandisan—Treas.; Andres C. Lubrin—Sgt.: Lorenzo P. Azaula—Aud.; Conrado P. Padrones, Jr.—P.R.O.
*Seated L-R*: Pedro C. Salazar—Vice President; Crisenciano Q. Dacumos—President: Ester T. Vergara—Secretary; Prof. Juanito D. Lamanilao—Adviser; Anacleto G. Duldulao—Rep. to FSBO.

Picture taken during the tree planting program, Bureau of Customs, on Dec. 16, 1963. L-R.—Administrtor Viado, Commissioner Lingad, Civil Service Commissioner Varela.

Under-Secretary Benito Montinola of Natural Resources (holding scale stick) with Regional Director Jose R. Claveria explaining proper way of scaling (middle w/ dark glasses) and Distric Forester Mario San Luis (in dark glasses w/ red cap) taken during joint inspection within Zamboanga City and Zamboanga del Sur.

*Occasion*: A visit to Montalban Reforestation Project, Montalban, Rizal, during the RA 3rd Anniversary on Stp. 15, 1963 held in this project.

L-R—Cip S. Roxas—Associate Editor, "Variety," Sunday Times; Felix Caliwag—Times Correspondence; Jose Viado—RA Administrator; Ramiro Alvarez—Com. on Agr. Productivity; Godofredo Roperos —Sunday Times.

The Philippine Institutions 100 Class under Prof. Jose B. Blando before the Rizal Monument at the Luneta.

View showing Dist. For. F. Atmosfera (1) planting the B.F. tree (Mahogany) in Mt. Minayakiya, Dingle, Iloilo, on July 24, 1963 with B.F., R.A., and other IDANREA folks being interested onlookers.

District Forester Francisco Barros and District No. 48 Personnel.

# FPRI Highlights

## FPRI HEAD SPEAKER AT 4TH VENEER AND PLYWOOD SEMINAR

Director Manuel R. Monsalud of the Forest Products Research Institute spoke before the Fourth Veneer and Plywood Seminar held at the Apo View Hotel, Davao City, from January 14 to 21, 1963. Aimed to develop knowledge and basic techniques in the processing of veneer and plywood and in the evaluation and control of quality in plywood manufacture, the seminar was sponsored jointly by the Plywood Manufacturers' Association of the Philippines (PMAP) and the Forest Products Research Institute (FPRI). Thirty four participants attended the seminar. Some came from plywood mills, others from veneer plants and plywood-machinery distributing firms. The Republic of Korea also sent one delegate. PMAP President Aurelio C. Lagman gave the welcome address. Plywood experts of the Institute also discussed papers on the various phases in veneer and plywood making. They included Asst. Director Francisco Tamolang, Foresters Dominador G. Faustino and Rodrigo R. Valbuena, Engineers Ramon P. Saraos, Reynaldo A. Adriano and Augusto Bati.

Others were Prof. Alfred H. Bishop and Mr. Armando Villaflor of the U.P. College of Forestry; Manager Mineleo Carlos of Resins, Inc.; President Thomas Norman of Borden Chemical (Phil.) Co.; Mr. Erwin Gabler, executive of Findlay Millar Timber Co.; Mr. Gus Arneson, technical director of Philippine Woodcraft & Veneer Corp., and District Forester Higinio Rebusora of Davao.

Field trips were conducted to log yards and plywood plants within the vicinity of the seminar site.

The closing remarks of Director Monsalud are reproduced below:

### CLOSING REMARKS

by

MANUEL R. MONSALUD

*Director, Forest Products Research Institute*

It is indeed a pleasure and an honor to address the participants of this seminar, jointly sponsored by the Plywood Manufacturers' Association of the Philippines and the Forest Products Research Institute. I am sure that interesting topics concerning veneer and plywood production had been discussed freely in this hall during the past few days. This body is like a clearing house of some factory problems concerning veneer and plywood and related matters. Here, free exchange of ideas is effected. It is my firm belief that, after a week's attendance in this seminar, the participants herein will be in a better position to discharge their duties and responsibilities when they go back to their work. In this connection, therefore, I congratulate the Plywood Manufacturers' Association of the Philippines for the moral and financial support it has extended to make this seminar a success.

The visits of the participants to some commercial plywood mills nearby have enabled them to observe certain techniques on veneer and plywood production which gave them some ideas that will no doubt improve their services to their respective companies.

It is a recognized fact all over the world that scientific research is the key to industrial progress. The Forest Products Research Institute is aggressively conducting research studies on, among other things, the production of veneer and plywood, trying to find out the proper techniques to use with our local wood species so that good-quality veneer and plywood could be produced. The findings of the Institute are gladly shared with the industries through letter-replies to inquiries, by consultation with representatives of the industry, or by the publication of technical notes and articles on subjects affecting veneer and plywood, etc. It is our desire to relay, with the least possible delay, to the industries concerned, whatever valuable information we have obtained in our researches so that those concerned may be able to avail themselves of our findings.

The presence and active participation here of an American plywood and veneer expert, Prof. Alfred Bishop of Syracuse University, is certainly of great benefit to our country because the technical know-how that this gentleman has imparted to us is of great value to this particular wood-using industry in the Philippines.

[1] Delivered at the closing of the Plywood Seminar, January 14-21, 1963, Davao City.

According to a newspaper article appearing in the Philippines Herald of April 21, 1962 issue, "the Philippine mahogany plywood has an $80 million market in the United States. The Philippines, endowed with adequate resources—a prodigious raw material reserve, the essential tools of production, competent know-how, the needed manpower—supplies an insipid 15 to 20% of the market. Japan, almost entirely dependent on this country for her mahogany (lauan) supply, provides well a high 60%. American manufacturers utilize Philippine logs and veneer to fill up the balance." This indeed is a dismal picture of our local plywood industry. Why should we be at the tail in this venture? Logically we should be in front and capture the greater bulk of the Philippine mahogany plywood export to the United States.

Our 1960-61 local timber production statistics show that during this period we produced 2,796,897,297 bd. ft. of timber valued at ₱230,751,840. Of this quantity, 1,283,880,480 bd. ft., or roughly 46.5 percent, was exported, mostly in the form of round logs. It would be to our greater advantage, I believe, if instead of exporting round logs we process them into veneer and plywood or other salable wood products. It is obvious that by such method more profits would go to the forest concessionaires and/or to those engaged in the manufacture of various products from wood. There is also another advantage that of giving more employment to unemployed or underemployed Filipinos. However, at this stage of our economy, it is not wise to have 100 percent ban on log exportations due to several reasons, some of which are:

1. We do not have as yet assurance that all round logs cut from the different forest concessions can be processed locally into veneer and plywood and other wood products for home consumption or for exports. Unemployment problem in the different forest concessions and logging business will immediately result.

2. It takes some time to put up wood-using plants such as a veneer and plywood mill.

We all realize also that there are many great problems confronting the Philippine plywood industry. Following are some of them:

a. Plywood produced in the Philippines, it is reported, is lower, as a general rule, in quality to plywood manufactured either in Japan or in America;

b. The cost of shipping logs from Mindanao, let us say, to Japan, is cheaper than to ship the same logs from Mindanao to Manila because the Japanese government is subsidizing Japanese bottoms at freight cost much lower than what Luzon-located plywood mills ordinarily pay for similar cargo shipped from Mindanao to Luzon, our interisland shipping rates being what they are today;

c. On top of this, it is reported that our local plywood makers, who have to buy logs from local forest concessions, have to shoulder the burden of a 7 percent sales tax; meaning to say, logs sold locally are taxed while those that are exported are exempted from this levy. Our legislators should remedy this situation.

3. Japanese labor is cheaper than local labor. This may be attributed to a great extent to the fact that the Japanese factory workers in a modern plant are more productive. They utilize practically every bit of wood and this is an advantage enjoyed by the Japanese plywood manufacturers. It is reported that the Japanese government, unlike the Philippine government, gives incentives for factory modernization.

4. It appears that the Philippine government does not seem to be much concerned about the plight of local plywood manufacturers. Excluding the problems of high transportation cost in the Philippines, both on land and at sea, plywood establishments here pay various kinds of taxes, duties and fees on imported machinery, equipment, spare parts and supplies. It is said that the Japanese companies enjoy exemption on these particulars. Their government is helping in every possible way to boost dollar-earning Japanese enterprises.

In order to remedy the situation, the following measures are suggested:

1. Present log exporters should be encouraged to go into manufacturing. The government should help supply the necessary technical know-how and that credit facilities should be extended to future entrepreneurs under easy terms of payment. Now factories should be given tax advantages at least during the initial years of their existence.

2. Plywood plants located in disadvantageous locations should be relocated, if possible. For example, factories that are very far from sources of raw materials should be transferred to concession areas. Obviously, this will cut transportation cost of logs from the forest to the mills. Generally, it is cheaper to ship finished products to the market than to ship logs from the concession areas to the mill site.

3. Modernization of existing plants should be done if feasible. Old companies producing plywood and veneer should be given technical

assistance in order that they could be modernized. Necessary financial help from government and/or private financial institutions should be extended to them.

4. More interisland ships would be procured either by private or government corporations so that shipping rates could be reduced. Unless that is done, development of a bigger domestic market will be impractical. Let us all bear in mind that a reliable domestic market for plywood is a good shock absorber or a dumping ground of products that can not be sold abroad but are perfectly usable in the country.

5. Our forest must be conserved. Kaiñgin and illegal cutting should be eliminated completely.

During my recent visit to seven countries of Europe (Italy, Spain, France, England, Sweden, West Germany, and Austria), I travelled quite extensively in many forestal regions over there and I did not notice at all any kaiñgin or burning in the forest. The European forests are certainly more efficiently managed than ours.

The plywood industry is directly dependent on a continuous supply of logs. It is, therefore, essential that steps be taken to establish permanent forest reserves that can perpetually supply logs to the mills. Selective logging is a "must" for obvious reasons.

Wood processing in our country brings some distinct advantages to us, namely:

1. We can earn more foreign exchange. More extensive processing of Philippine logs into veneer and plywood of good quality also means bigger export of plywood to America, which naturally will bring in more dollars to the country.

2. Wood residues from the mills may be used to start secondary wood industries. For example, veneer wastes, cores, and other wood residues from sawmills can be used to produce pulp and paper, as is done in Japan and in some mills in the United States, charcoal and charcoal briquettes, particleboard, fiberboard, etc. In my second trip to Japan in 1959, I was privileged to visit a big sulfate pulp mill near Nagoya using nothing but chipped veneer waste from imported Philippine lauans. The pulp produced therefrom is converted into paper by some Japanese paper mills.

3. The erection of more mills, or the enlargement of present veneer and plywood factories, will effect greater employment for the Filipinos that are presently underemployed or unemployed.

4. By decreasing our log export and using these logs for local processing into plywood will surely mean lesser competition on the part of foreign plywood manufacturers such as the Japanese.

Anywhere, it is the superior quality product that commands high price in the market. Therefore, other things being equal, the more well-versed our technicians are in the plywood mills, the better quality plywood can be produced by them.

I happened to visit recently a few plywood and veneer mills abroad such as in Thailand, Spain, France, Germany and in Austria. Some of those that I saw are smaller than many of our mills here and are of older vintage. However, their technicians seem to have greater skill and experience and they produce good quality products. In countries like France, England, Sweden, Germany and Austria, they manufacture plywood glues. Naturally the price of glues over there is cheaper than that of the glues we are using here which are mostly imported. As a result, they generally produce plywood at a cheaper price than we do in the Philippines.

In a small suburb of Vienna, for example, I visited a plywood factory which is 44 years old, (Slavonia Plywood, Veneer, Parquet, and Sliced Veneer Co.). This factory produces principally plywood, parquets and sliced veneers, and some pieces of furniture. In addition to rotary cutting, they have modern equipment for slicing very thin veneers which they use as facing for particleboards. In this particular mill, I saw a Philippine wood called *dao* (*Dracontomelon dao*) being sliced very thinly. I was informed that this Philippine wood costs no less than $320 per cu.m. delivered in Vienna. It is more expensive than the famous teak wood of Thailand which that factory is buying at $100 per cu.m.

If any of our Philippine forest concessionaires has big quantity of *dao*, or any similarly beautifully grained wood, I believe there is a good and ready market in Europe, such as in Germany, France, Austria or England. The European countries import most of their peeler logs from Africa.

I hope that the Plywood Manufacturers' Association of the Philippines will adopt strong measures to effect good quality control of its plywood products. Why should there be no very effective standardization of plywood in this country? For local consumption, there is no standardization of plywood products that I know. Why? For export, theoretically there is standardization but who enforces it?

It is a good practice to have technical seminars of this nature held every now and then to serve as a clearing house of factory problems. Also, others who did not have the opportunity to attend this seminar will be given a chance in the

future, I hope, to improve their technical know-how.

Thanks should be expressed to all those responsible for the setting up of this plywood seminar and the owners of the mills visited for the courtesy and cooperation they have extended to this group.

Lastly, I wish the present participants success in their future work.

* * *

## U.P. PRESIDENT VISITS FPRI

Dr. Carlos P. Romulo, President of the University of the Philippines, visited for the first time the Forest Products Research Institute on September 26, 1963 and presided over the meeting of the Forest Products Research Board held on the same day. President Romulo inducted into office Regent Florencio Tamesis who was reappointed member of the FPRB for another term.

At the impromptu talk which followed the luncheon tendered in his honor, President Romulo candidly asserted that "The Institute has a good director because he is of my own size and that we can see eye to eye the problems of the Institute".

His talk dwelt on a wide range of subjects, from the more sober topics of the FPRI's role as a research institution and its contribution to the future of the country to that pecularities of Filipinos as a people and how they are compared with peoples of the neighboring countries in Asia, particularly that of Japan. "We must look for aspirations to Japan's progress", he said, "as she forges ahead in technology while holding fast to her ancient cultural moorings". He also emphasized a steady and more solid FPRI-College of Forestry cooperation and exhorted every employee to work faithfully and diligently for the economic development of the Philippines.

Before leaving for the College of Agriculture, President Romulo was given a guided tour of the different laboratories and physical plants of the Institute by Director Manuel R. Monsalud and Board Member Jose G. Sanvictores. The U.P. head highly praised the cleanliness, set-up and research activities of the Forest Products Research Institute.

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## SEMINARS

Dr. William L. Stern, Curator of the Division of Plant Anatomy at Smithsonian Institution and presently FAO Consultant on wood technology at the FPRI, gave a seminar on "Phylogenetic Specialization of Wood in Dicotyledons" at the UPCA Lecture Hall last September 25, 1963.

Beginning January 14 to March 15, 1964, Dr. Stern also conducted a series of lectures on the "Anatomy and Development of Woody Stem" every Wednesday, 10:00 a.m. to 12:00 noon at the FPRI conference room.

* * *

## TO ROME CONFERENCE

Director Manuel R. Monsalud attended the 12th FAO Biennial Conference in Rome, Italy, held from November 6 to December 6, 1963. He was a member of the official Philippine delegation and acted as technical adviser to the chief delegate, Secretary Jose Y. Feliciano of the Department of Agriculture and Natural Resources, on matters concerning forest products research and utilization. From Rome, Dir. Monsalud visited the Fibres and Forest Products Research Institute at Jerusalem, Israel before coming home. He laudably praised Israel's progress in textile manufacture and in researches on the application of fire-retarding chemicals on wood and fiberboards. Israel extracts its potassium and bromide salts from the waters of the Dead Sea. Mr. Monsalud pointed out that the multilinguistic capabilities of Israel's scientists give them an edge over those of other countries because they can easily have access to technical literature written in different languages.

* * *

## FPRI CELEBRATES SCIENCE WEEK

The Forest Products Research Institute put up exhibits at the N.S.D.B. compound on Herran, Manila in connection with the national Science Week celebrations held December 2 to 8, 1963. Asst. Dir. Francisco N. Tamolang, speaking on behalf of Dir. M. R. Monsalud, who was then abroad, averred that the FPRI exhibits really attracted a sizeable crowd considering that what were displayed were indeed bits of science and technology. Besides the pictorials on the different stages of processing and testing of wood specimens, lumber grading and log sawing, there were also shown plywood products, products of the utilization of wood wastes and samples of quality-processed pulp and paper prepared at the FPRI chemical laboratories. Several other wood fabrications were displayed, aside from the scale models of sawmills, charcoal production machines and a briquet-making unit.

Asst. Dir. Tamolang also read a paper, co-authored by P. V. Bawagan, on "Pulp and Paper Research and Industry Problems in the Philippines" during the

agricultural symposium on December 3, 1963, at the N.S.D.B. auditorium.

On December 5 of the same year, the Institute sponsored a symposium on the "Highlights of Forest Products Research in the Philippines—1963" at its conference room in College, Laguna.

Following a brief welcome address by Director-Emeritus Eugenio dela Cruz, the following presented papers: F. M. Lauricio on "Why test wood?"; B. A. Lomibao and J. P. Rojo, "Grain, texture, color and figure of Philippine woods"; P. V. Bawagan and J. O. Escolano, "Kraft pulping and papermaking characteristics of Philippine commercial woods"; R. P. Saraos and R. C. Eala, "Research on veneer manufacture in the Philippines; and, R. T. Cortes, "Kiln-drying schedules of some Philippine commercial woods". Assistant Director F. N. Tamolang gave the closing remarks.

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## COMING AND GOING

Mr. Emmanuel Bello of the Wood Preservation Division left for Syracuse, New York on a 12-month AID-NEC fellowship on wood seasoning.

Mr. Toradio Cuaresma enplaned for India to pursue a 6-month training course on seasoning and wood preservation at the Dehra Dun Forest Research Institute.

Mr. Maximo Sagrado, chief of the sawmill improvement section, IID, was awarded a 5½-month extension to finish his M.S. degree in logging engineering at the University of Washington.

Mrs. Emma A. Philipps (FAO Andre Mayer Fellow) has also been given one more year to complete her research studies at Yale University on the "Relationship between fiber characteristics and pulp-sheet properties of Philippine hardwoods".

Director-Emeritus Eugenio dela Cruz and Asst. Director Francisco N. Tamolang arrived October 5, 1963, after attending the 5th FAO Wood Technology Conference held in Madison, Wisconsin, U.S.A. Delegate dela Cruz was elected Vice Chairman of the international conference.

Mr. Oscar Cadeliña of the IID arrived Novem-November 21, 1963 after a 6-month training in Japan on wood processing under the Colombo Plan.

Mr. Adolfo S. Decena, junior forest products technologist left November 29, 1963 for Frankfurt, Germany to train in lumber processing for 16 months under the German Technical Assistance Program.

Wood tech's Benigno A. Lomibao left January 12, 1964 for Syracuse University to undergo a 2-year AID scholarship for an M.S. degree in forestry engineering specializing in electron miscroscopy. A week later, Mr. Salvador M. Fanega of the Chemical Investigations Division enplaned for the University of Wisconsin, Madison, USA, for a 24-month FAO sponsored study in wood chemistry leading to a doctorate degree.

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## FPRI PUBLIC SERVICE

As part of the technical assistance extended to the public, the Institute sponsors periodic training courses on various fields of forest products utilization. Thus far, it has trained the following:

Mr. Tereso F. Geronimo of P.E. Domingo & Sons for a month's training in kiln and boiler operation beginning October 1, 1963;

Fourteen personnel of the Cabunian Wood Arts along wooodworking;

Mr. Fernando G. Tinio Jr., of NACIDA, for six weeks on charcoal briquetting, wood distillation, wood waste utilization, plywood making and gluing, hand-made paper and fiber extraction; and

Mr. Thelmo Magnaye of the Abaca Development Board on pulp and paper making starting October 17, 1963.

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## TRAINING COURSES COMPLETED

Messrs. Melecio B. Avanzado and Isidro Zamuco completed a 6-week training course on radiosotope techniques sponsored in Manila by the Philippine Atomic Energy Commission.

Dr. Agustin N. Ramos Jr. and Mr. J. O. Siopongco attended the 4-day First Asia-Australian Conference of Architects and Structural Engineers held at the WHO Auditorium.

Messrs. A. Gruela and R. del Rosario have been designated to participate in the special training course on "Design of Folded Plate Structure" sponsored by the SEATO Graduate School of Engineering and the Association of Government Civil Engineers of the Philippines (AGCEP).

TPED Chief Simplicio B. Bellosillo and Associate Civil Engr. Jose Laranang were named delegates to the AGCEP convention held from January 22 to 25, 1964 at the Commercial Bank and Trust Co. Bldg., Makati, Rizal.

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## VISITORS

Messrs. Pultra Vimolsiri and P. P. Sudasna and 52 other Thai government officials; Mr. Douglas L. Adkins, Financial Chairman of the Bamboo Products Research Committee; Dr. & Mrs. Henry Allen Moe of 149 Broadway, New York 6, N.Y.; Prof. & Mrs. R. T. W. Le Feyre, University of Sydney, Australia; German forester Dr. Herbert Hesmer and wife, University of Bonn, Germany; Mr. Tirso de Castro, General Manager, Asiatic Steel Manufacturing Co.; Mr. Martti M. Kaila of Helsinski, Finland; Mr. Aung Din, FAO Regional Forestry Officer, Bangkok, Thailand, who came to discuss proposals for the 1965-66 project requests under the UN Special Fund, Freedom from Hunger Campaign, World Food Program, work of the FAO Sub-Committee on Eucalyptus and Pinus species, forthcoming meetings of the Forest Technical Committee in Rome and the 7th Session of the Asia-Pacific Forestry Commission in New Zealand; Mr. Louis Heimbach of Certified Mfg. Co., New York; Mr. Lennart Borup of Swedish State Railways Board, Stockholm, Sweden; Messrs. Suraphol Sanguansri, Tanit Malisuwan, Pittha Bunnab, Vithan Santi, Suwachara Saengprasert and Dhamnoon Singkaselit, all Thai scientists; Mr. Tan Teh Toon, Kuala Lumpur, Federation of Malaya; Mr. James W. Barker, Stockton, California; Mr. Leo O'neil, New York; Mr. & Mrs. Lars Gunnar Samuelsson of Stockholm, Sweden; British Ambassador to the Philippines J. Addis; Mr. Digu Bheuraskar, Budgetary Research Section, Fiscal and Financial Branch, Department of Economics and Social Affairs, UN, N. Y.; Dr. & Mrs. Enrique Beltran, zoologist, wildlife expert and alumnus of Columbia University, from Mexico; Yoshizo Kobayashi, Japanese forester of Mitsui & Co. Ltd., Tokyo; Dr. David B. Hand, Cornell University, Ithaca, N.Y.; Dr. Tsutomu Kayama of the Government Forest Experiment Station, Tokyo; Mr. John B. Fisher of Fisher-Price Toys, New York; UNTAB Deputy Resident Representative Stig Anderson; Col. & Mrs. Harry A. Brenn, former head of ICA.

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# FPRI Technical Notes

## DISTINCT ADVANTAGES OF PLYWOOD OVER SOLID WOOD

Plywood is being used in ever-increasing quantities for many purposes for both exterior and interior use. In the Philippines, plywood is now being used in the construction of houses and buildings for siding, ceilings, floors, partitions, concrete forms, and in woodcraft for furniture, cabinets, and toys. This widespread use is attributed to its properties that offer the following distinct advantages over those of solid wood:

(a) *Distributed wood strength in plywood*

The veneers which compose a glued plywood panel are laid in such a way that the grain direction of each successive piece is at right angle to the other. This arrangement permits the predominant strength of the veneer along the grain direction to be distributed both parallel and perpendicular to the edge of the plywood panel. For example, a three-ply panel, consisting of 1/16-inch face and back and 1/8-inch core of the same species, gives a construction which has approximately equal strength in each direction. A greater number of plies for a given thickness provides a more uniform distribution of stress across the thickness.

This advantage, if utilized, makes it possible to have more latitude in the utilization of plywood units especially in construction where the strength in both directions is required.

(b) *Greater resistance to splitting and checking*

A piece of solid wood splits more readily than plywood of the same thickness when nails are driven or when a sidewise strain is put on a nail, screw or bolt, or when it is bent sidewise. This tendency of splitting is considerably less in plywood so that its edges could be fastened with nails or screws closer together. It also eliminates the necessity of boring holes for fasteners and permits easy assembling of all types of plywood products. An important precaution, however, must be observed when pulling nails from plywood. Nails should be pulled straight out, or nearly so, because splintering of the outside ply may result if the nails are pulled or pried at an angle.

(c) *Less change in dimensions with changes in moisture content*

This characteristic property applies only to the dimensional change across the width of the panel because, in thickness, the dimensional change of plywood and solid wood may be considered as similar.

The less change in dimension in plywood is due to its construction in which the alternate plies are glued together with the grain direction of one at right angles to that of the adjacent plies. Since wood shrinks and swells almost negligibly along the grain, this manner of assembly lessens the tangential shrinkage and swelling across the width of the panel. Although the dimensional change parallel to the grain is increased by this method over that of solid wood, the difference is considered relatively small and, in most applications, it is never looked upon as an objectionable feature. Consequently, the relative dimensional stability of plywood in comparison to that of solid wood makes plywood generally preferred for furniture, radio cabinets, doors, desks, etc.

(d) *Available large area in plywood*

The width of a solid piece of wood is limited to the diameter of the log when plain-sawn and one-half of that when quarter-sawn. In extremely large logs, the width of solid wood that could be cut becomes unpredictable because it is likely that major defects such as brash center, heart rot, and others may be present. Certain limitations are also imposed on the width by the shrinkage and swelling of solid wood.

On the other hand, the size of a plywood panel is limited only by the length of the veneer which can be cut and handled economically with a minimum amount of degrade. The standard size of a plywood panel is 4 feet wide by 8 feet long. Although such a piece has a length shorter than most of the lumber being solid commercially, it is considerably wider. Greater widths require lower joints for the same linear dimension, that is why plywood is used for siding, partitions, or even as flooring.

(e) *Availability of matched and symmetrical faces*

Attractive plywood panels, in which the face veneers are either book-matched, slip-matched, butt-matched or arranged geometrically, have been used extensively. Of course, solid wood could also be arranged or assembled in a similar pattern. The use of veneer, however, is more effective and economical. In book matching, for example, two sheets of veneer are matched together by turning the adjacent sheet over in a manner similar to turning the page of a book. Such effects are not easily obtainable in solid wood because it will be unreasonably difficult to obtain in a lumber yard the same or similar figures. Veneer sheets are thin and, therefore, consecutive pieces that are produced are practically identical in appearance.

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## FIBER IDENTIFICATION FOR THE PHILIPPINE PULP AND PAPER INDUSTRY

The question may be asked, "From what species of wood is this sample of pulp or sheet of paper made of?" Unlike in the identification of wood, to answer this question presents a more difficult situation because, in the pulp or paper sample, the fibers have undergone some physical and chemical changes so that the relations of the wood elements to each other are no longer traceable as distinguishing characteristics. Moreover, the reaction of chemicals and the physical changes, resulting from pulping and beating, may partially obscure or destroy the minute characteristics which provide the means for the identification of the species of wood on plant used in the finished product, i.e., based on the identification of the fibrous materials or simply fiber identification.

For accurate results in fiber identification, considerable training and experience are essential. It is recommended that the analyst should make frequent use of standard samples of known composition or of authentic fiber samples and should become thoroughly familiar with the appearance of the different fibers and their behavior when treated with the various stains.

Fiber identification, in the paper industry in some special cases, has become increasingly important to insure the delivery of paper made from specified type of pulps for papermaking and to prevent substitution of inferior or cheaper fibers. This also may serve as a basis in preparing specifications where a particular type of paper is to be duplicated. There are, however, other ways of duplicating paper of the same quality.

### *Fiber Identification Methods*

There are three general ways of identifying fibers: macroscopic, microscopic and chemical means.

1. *Macroscopic test.*—The macroscopic method includes the burning test which is accomplished by pulling a few fibers or a piece of the paper sample and burning it in an open flame. The odor, color, and shape of the ash should be noted; also, whether or not the fibers burn slowly, fast, melt, or do not burn at all. Its application is rather limited in that it permits only the classification of the fibers as to origin (natural animal, natural vegetable, natural mineral and man-made fibers) but not as to species.

2. *Microscopic characteristics.*—In the microscopic examination, the minute anatomical features noted are described in the Technical Note No. 39 (Structure of Papermaking Fibers).

3. *Chemical tests.*—One of the chemical means in fiber identification is the solvency test in which the sample is dissolved into certain chemical substances. The other method of identification is through color reactions to stains. The stains are used mainly to ascertain the classes of pulps (sulphate, soda, groundwood, and semi-chemical pulp). Roughly, rag fibers (linen, cotton) become wine red when "iodine-iodine metallic salt stain" is applied. This same stain reacts with groundwood and jute, which turn to yellow but, with chemical wood fibers (fibers separated from wood by chemical means), variations of blue, gray, brown, or purple are common.

### *Morphological Characteristics of Some Woody and Nonwoody Fibers*

A. *Seed hairs*

1. Kapok (*Ceiba pentandra* (L.) Gaertn.) BOMBACACEAE [1]

[1] Word in capital letters refers to the family to which the particular species belongs.

*Fibers* are extremely long,[2] range 8.34 mm. to 30.78 mm. (predominant range—15.80 mm. to 23.30 mm.), average length 19.62 mm.; average width 0.034 mm.; average lumen width 0.032 mm.; thin[3] walls' average thickness 0.001 mm., range 0.007 mm. to 0.001 mm.; appear like broken transparent tubes but spiral thickenings are present at the rounded fiber ends or tips.

B. *Bast fibers*

2. Paper mulberry (*Broussonetia papyrifera* (L.) Vent.) MORACEAE

*Bast fibers* are exremely long, range 2.33 mm. to 9.91 mm. (predominant range—3.50 mm. to 8.00 mm.), average length 5.72 mm.; average width 0.017 mm.; average lumen width 0.003 mm.; thick[3] walls' average thickness 0.007 mm.; range 0.004 to 0.012 mm. (predominant range—0.005 to 0.008 mm.); characterized by faintly-marked walls; the ends are thin and pointed; and, at a higher magnification, the fibers are seen to be enveloped in a thin transparent cuticle.

C. *Leaf fibers*

3. Abaca (*Musa textiles* Nee) MUSACEAE

*Fibers* are extremely long, range 1.55 mm. to 6.24 mm. (predominant range—2.50 mm. to 4.50 mm.), average length 3.15 mm.; average width 0.020 mm.; average lumen width 0.013 mm.; thin walls' average thickness 0.004 mm., range 0.003 mm. to 0.007 mm. (predominant range—0.003 mm. to 0.004 mm.), with simple pits. *Vessels* are extremely difficult to find. *Parenchymatous cells* are 0.218 mm. in average length; range 0.099 mm. to 0.579 mm. (predominant range—0.122 mm. to 0.278 mm.); average width 0.125 mm., range 0.033 mm. to 0.311 mm. (predominant range—0.067 mm. to 0.178 mm.).

D. *Stem fibers*

4. Kauayan-tinik (*Bambusa blumeana* Schultes f.) GRAMINAE

Typical *fibers* are moderately long, range 0.60 mm. to 5.80 mm. (predominant range—0.60 mm. to 3.00 mm.); average length 2.02 mm.; average width 0.018 mm.; average lumen width 0.004 mm.; thick walls' average thickness 0.007 mm.; range 0.003 mm. to 0.013 mm. (predominant range—0.006 mm. to 0.009 mm.). *Vessels* are extremely short to very long,[4] average length 0.61 mm., range 0.23 mm. to 1.22 mm. (predominant range—0.28 mm. to 0.81 mm.); average width 0.125 mm., range 0.022 mm. to 0.411 mm. (predominant range—0.022 mm. to 0.178 mm.); intervessel pitting small,[5] average length 0.004 mm., simple, alternate, with apertures tending to coalesce to form linear pits. *Parenchymatous cells* are 0.123 mm. in average length, range 0.044 mm. to 0.256 mm. (predominant range—0.089 mm. to 0.44 mm.); average width 0.048 mm., range 0.022 mm. to 0.089 mm. (predominant range—0.003 mm. to 0.067 mm.)

5. Sugar cane bagasse (*Saccharum officinarum* L.) GRAMINAE

*Fibers* are moderately long, range 0.64 mm. to 3.08 mm. (predominant range—1.12 mm. to 2.30 mm.), average length 1.85 mm.; average width 0.026 mm.; average lumen width 0.016 mm.; thin walls' average thickness 0.005 mm., range 0.003 mm. to 0.010 mm. (predominant range—0.004 mm. to 0.006 mm.); with simple pits. Comparatively short pitted-fiber-like cells are thin-walled and with blunt, oblique or forked ends. *Vessels* are moderately short to extremely long, average length 1.26 mm., range 0.29 mm. to 2.22 mm. (predominant range—1.02 mm. to 1.56 mm.); average width 0.076 mm., range 0.033 mm. to 0.122 mm. (predominant range—0.004 mm. to 0.100 mm.); perforation is simple; intervessel pitting is small, average length 0.004 mm., range 0.003 mm. to 0.006 mm. (predominant range—0.003 mm. to 0.006 mm.), simple, alternate, with apertures tending to coalesce to form linear pits. *Parenchymatous cells* are 0.355 mm. in average length, range 0.033 mm. to 0.722 mm. (predominant range—0.200 mm. to 0.411 mm.); average width 0.177 mm., range 0.022 mm. to 0.287 mm. (predominant range—0.067 mm. to 178 mm.); sparsely to copiously pitted. Epidermal cells may also be observed and appear as narrow, rectangular-pitted elements with slightly undulating margins. The stomata, including the two accompanying guard cells, are oval in shape and have entire margin.

E. *Wood fibers*
*Coniferous wood*

6. Benguet pine (*Pinus insularis* Endl.) PINACEAE

*Tracheids* are of medium length,[6] range 1.20 mm. to 7.19 mm. (predominant range—2.40 mm.

[2] Fiber length is based from the classification of the International Association of Wood Anatomist (IAWA).
[3] Cell-wall thickness is based on Runkel grouping.
[4] Vessel length is based from the classification of the IAWA.
[5] Intervessel pitting is based from the classification of M.M. Chattaway.
[6] Tracheid length is based on Chen Chi Ling's classification.

to 4.19 mm.), average 3.45 mm.; average width, 0.41 mm. average lumen width, 0.029 mm.; thin walls' average thickness, 0.006 mm., range 0.001 mm. to 0.013 mm. (predominant range—0.003 mm. to 0.009 mm.); bordered pits (average 0.021 mm.) are mostly uniseriate and occasionally biseriate, opposite to alternate with each set of pits separated by crassulae. *Ray-contract area pitting* is similar to that of Mindoro pine but with more and larger window-like pits, 1 to 2 (generally 1) per cross field.[7] *Ray tracheids* are present with non-dentate walls. *Vertical parenchyma* is absent.

*Hardwoods*

7. Gubas (*Endospermum peltatum* Merr.) EUPHORBIACEAE

*Fibers* are moderately long, range 0.64 mm. to 3.19 mm. (predominant range—1.20 mm. to 2.40 mm.), average length 1.64 mm.; average width 0.044 mm.; average lumen width 0.032 mm.; thin walls' average thickness 0.006 mm., range 0.003 mm. to 0.016 mm. (predominant range—0.003 mm. to 0.006 mm.), with conspicuous bordered pits. *Vessels* are medium in size to extremely long, average length 1.30 mm., range 0.40 mm. to 1.91 mm. (predominant range—0.92 mm. to 1.67 mm.); average width 0.310 mm. range 0.104 mm. to 0.495 mm. (predominant range—0.242 mm. to 0.449 mm.); perforation simple, horizontal to slightly oblique; intervessel pitting is small to medium in size, average length 0.006 mm., range 0.003 mm. to 0.009 mm., bordered, alternate; ray vessel pitting is circular to elongated and much larger than intervessel pitting. *Vertical parenchyma* has large, circular to elongated pits. *Ray parenchyma* is copiously pitted with small to large circular-simple pits. *Crystals* are present.

8. Kaatoan bangkal (*Anthocephalus cadamba* Miq.) RUBIACEAE

*Fibers* are medium in size, range 0.60 mm. to 2.80 mm. (predominant range—1.20 mm. to 1.80 mm.), average length 1.43 mm.; average width 0.035 mm.; average lumen width 0.026 mm.; thin walls' average thickness 0.004 mm., range 0.009 mm. to 0.0129 mm. (predominant range—0.0029 mm. to 0.0057 mm.), pits are indistinctly bordered. *Vessels* are medium in size to very long, average length 0.795 mm., range 0.437 mm. to 1.127 mm. (predominant range—0.598 mm. to 1.035 mm.); average width 2.19 mm., range 0.069 mm. to 0.356 mm., (predominant range—0.184 mm. to 0.258 mm.); perforation is simple, oblique, intervessel pitting is simple, alternate, minute to small, average length 0.003 mm., range 0.002 mm. to 0.005 mm. (predominant size—0.002 mm.), rounded, with pit apertures tending to coalesce; ray-vessel pitting is rounded to elongated simple pits. *Vertical* and *ray parenchyma* have rounded to elongated pits. *Crystal* and silica are absent.

9. Moluccan sau (*Albizia falcata* [L.] Back.) LEGUMINOSAE

*Fibers* are medium in size, range 0.60 mm. to 1.79 mm. (predominant range—0.80 mm. to 1.39 mm.), average length 1.11 mm.; average width 0.024 mm.; average lumen width 0.017 mm.; thin walls' average thickness 0.0035 mm., septate, with few simple pits. Vessels are moderately short to medium in size, average length 0.53 mm., range 0.25 mm. to 0.79 mm. (predominant range—0.41 mm. to 0.69 mm.); average width 0.274 mm., range 0.092 mm. to 0.426 mm. (predominant range—0.196 mm. to 0.450 mm.); perforation is simple, horizontal to slightly oblique; intervessel pitting is very small to large, average length 0.006 mm., range 0.003 mm. to 0.011 mm. (predominant range—0.004 mm. to 0.009 mm.), bordered, alternate, with coalescent apertures; ray-vessel pitting is similar to intervessel pitting. *Vertical parenchyma* is abundant with both small and large circular-simple pits. *Ray parenchyma* has small simple pits. *Crystals* are present.

## *Reaction to stains*

A. *Norval Wilson stain*[8]

| *Types of pulps* | *Colors produced* |
|---|---|
| 1. Abaca, bleached soda: | |
| (a) Fibers | pale reddish brown |
| (b) Parenchyma | very pale reddish-brown |
| (c) Vessels | bright yellow |
| 2. Benguet pine, unbleached soda: | |
| (a) Fiber tracheids (tracheids) | yellow-orange |
| (b) Parenchyma | —do— |
| 3. Benguet pine, unbleached sulfate: | |
| (a) Fiber tracheids (tracheids) | brownish-gray |
| (b) Parenchyma | —do— |
| 4. Gubas, unbleached neutral sulfite semi-chemical: | |
| (a) Fibers | bright yellow-green |
| (b) Parenchyma | —do— |
| (c) Vessels | —do— |
| 5. Gubas, unbleached, sulfate: | |
| (a) Fibers | pale gray |
| (b) Parenchyma | very pale gray |
| (c) Vessels | pale gray to bluish-gray |

[7] As confirmed by microscopic examinations of wood section slides.

[8] For stain solution.

6. Kaatoan bangkal, unbleached sulfate:
   (a) Fibers .. brownish-gray to grayish-gray
   (b) Parenchyma ..... pale gray
   (c) Vessels ..... gray

7. Kauayan-tinik, unbleached soda:
   (a) Fibers ..... yellow-green to brown
   (b) Parenchyma .... grayish-brown to gray
   (c) Vessels ..... yellow-brown

8. Moluccan sau, unbleached sulfate:
   (a) Fibers ..... pale gray
   (b) Parenchyma ..... very pale gray
   (c) Vessels ..... bluish-gray

9. Sugar cane bagasse, bleached sulfate and soda:
   (a) Fibers ..... purplish red
   (b) Parenchyma ..... light purplish red
   (c) Vessels ..... very light purplish red

10. Sugar cane bagasse, unbleached sulfate:
   (a) Fibers ..... purplish red
   (b) Parenchyma ..... light purplish red
   (c) Vessels ..... very light purplish red

11. Kapok, unbleached sulfate:
   (a) Fibers ..... reddish purple to bluish purple with tint of green and yellow to greenish yellow
   (b) Parenchyma ..... yellow and light purplish purple blue
   (c) Vessels ..... purple blue

B. *Graff C stain*

1. Abaca, bleached soda:
   (a) Fibers ..... reddish-brown
   (b) Parenchyma .. reddish-brown and yellow

2. Benguet pine, unbleached sulphate:
   (a) Fibers ... light brown to yellowish brown
   (b) Parenchyma ..... very light brown

3. Gubas, unbleached neutral sulphite semi-chemical:
   (a) Fibers ..... bright greenish-yellow to yellow-orange
   (b) Parenchyma .... —do—
   (c) Vessels ..... —do—

4. Gubas, unbleached sulphate:
   (a) Fibers . reddish-brown to light blue green
   (b) Parenchyma .... very light blue green to light greenish-ash gray
   (c) Vessels ..... medium blue green to greenish light ash-gray

5. Kaatoan bangkal, unbleached neutral sulphite semi-chemical:
   (a) Fibers ..... bright greenish-yellow
   (b) Parenchyma ... —do—
   (c) Vessels ..... —do—

6. Kaatoan bangkal, unbleached sulphate:
   (a) Fibers ..... dark reddish-brown to greenish purple
   (b) Parenchyma ..... light greenish-purple
   (c) Vessels ..... yellowish-blue green

7. Moluccan sau, unbleached sulphate:
   (a) Fibers ..... medium reddish-brown and medium gray to yellowish-blue green
   (b) Parenchyma ..... light medium gray to light yellowish-blue green
   (c) Vessels ..... blue-green to yellowish-blue green

8. Sugar cane bagasse, bleached sulfate and soda:
   (a) Fibers ..... purplish red
   (b) Parenchyma ..... light purplish red
   (c) Vessels ..... very light purplish red

9. Sugar cane bagasse, unbleached sulfate:
   (a) Fibers ..... purplish red
   (b) Parenchyma ..... light purplish red
   (c) Vessels ..... very light purplish red

C. *Modified bright stain*

Sugar cane bagasse, bleached sulfate .... red
Sugar cane bagasse, unbleached sulfate .. blue

10. Kapok, unbleached sulfate:
   (a) Fibers ..... reddish purple to bluish purple with tint of green and yellow to greenish yellow
   (b) Parenchyma ..... yellow and light purplish purple red
   (c) Vessels ..... purple blue

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## PULP AND PAPERMAKING FROM HARDWOODS

The principal source of pulp is wood, which, according to common usage, is classified into softwoods (*conifers*) and hardwoods (*broad-leaved*) species.

Pulp from conifers now accounts from 85 to 90 percent of the world pulp production; 10 to 15 percent comes from hardwoods and other cellulosic raw materials. The predominance of conifers arises, in part, from their longer fibers which make strong pulp.[1] Hardwoods, generally, have fibers shorter than those of conifers and produce pulps which have lower tearing resistance and folding endurance, but possess good burst and tensile strength. The addition of a certain amount of hardwood pulp to the softwood fiber constituents of the paper furnish was found to improve the formation, smoothness and printing qualities of the paper.

The scarcity of conifers in the Philippines makes it necessary to utilize the hardwoods, which are available in abundance, for the manufacture of pulp. Tropical hardwood forests, however, lack the homogeneity of the species. The number of wood species in Philippine forests is estimated to be more than 3,500 although the majority of these are not commercially important. In any Philippine forest, therefore, there are many species of wood likely to be standing together. Unlike most temperate forests, a natural hardwood stand of any size, consisting of one or two species, is seldom found in the Philippines. This makes it imperative to consider, for pulping such hardwoods, any process that could make use of mixtures with a minimum of sorting out the different species.

The wood may be brought to the mill by any practical method of transportation such as by water, rail, trucks or tractors. After storage in the yards or ponds, the logs are cut to suitable lengths and the barks removed. In addition to pulpwood, other sources of raw materials worth considering are plywood mill log cores and sawmill slabs and edgings. Except for wood which is to be ground in grindstone, the wood must be further reduced in size by chippers.

Several processes are available for converting hardwoods to pulp. Brief descriptions together with the uses of the correspnoding pulp are given below:

1. *Groundwood or mechanical process*

This is the simplest and, where the cost of power is low, the cheapest process.

*a. Conventional groundwood.* In principle, this consists of pressing the wood (*by hydraulic or other means*) against a revolving grindstone. A stream of water, among others, softens the wood and cools the stone at the same time. The pulp is up to 95 percent of the oven-dry weight of the wood.

[1] Bamboos, abaca and ramie also have long fibers and make strong pulps.

For this process, the most suitable woods are light-colored and of low or medium density. Woods with high extractive content, high density, and dark color are generally undesirable for making groundwood pulp.

Groundwood pulp is widely used in the manufacture of newsprint and printing papers due to its high bulk, opacity and excellent ink absorbency. For newsprint, the normal coniferous groundwood-pulp portion is 70 to 80 percent and the remainder is chemical pulp. When using groundwood pulp from hardwoods, the proportion of chemical pulp must be increased because of the lower strength characteristics of hardwood-groundwood pulp.

*b. Chemigroundwood process.* The debarked logs are impregnated with a neutral sulfite liquor (*a mixture of sodium sulfite with either sodium bicarbonate or sodium carbonate*) by vacuum and pressure treatment in a closed vessel. Then the chemically-treated logs are ground in the same manner as in the normal groundwood process. The pulp yield is slightly lower, up to 90 percent. The advantages of the chemigroundwood process over the conventional groundwood process include less power consumption and better pulp strength. The color of the pulp is likely to be darker but it is usually readily lightened by the use of a small amount of bleaching agent. The pulp can be used in the manufacture of newsprint, printing paper, book, toweling, tissue and corrugating grades.

*c. Groundwood from chips.* The wood chips, with or without chemical pretreatment, are fiberized in disk refiners, usually in more than one stage to produce groundwood-type pulps. For best results, hardwood chips require pretreatment, usually with caustic soda or neutral sulfite liquor. In such cases where chemical pretreatment is required, the pulp is actually a *semichemical pulp*. Sometimes, it is appropriately called *chemimechanical pulp* because of its very high pulp yield. (*Neutral sulfite and cold-soda semichemical pulpings are more fully described under semichemical methods*). The physical properties of such pulps are, in some cases, at least comparable to conventional softwood-groundwood pulp and their higher freeness permit higher paper machine speeds. Such pulps are used as substitutes for part of the groundwood-pulp furnish in newsprint, magazine paper and other printing papers.

2. *Chemical method*

The wood chips are digested or "cooked" with chemicals under pressure and high temperature in rotary, stationary or continuous digesters in order to separate the fibers from all or most of the non-cellulosic incrusting materials, principally *lignin*. Different chemicals are used in the various chemical processes.

*a. Sulfite or acid process.* The cooking liquor consists of a mixture of sulfurous acid and any of the bisulfites of calcium, magnesium, ammonium, or sodium. Pulp yields as high as 60 percent may be attained. The resulting pulp is relatively light-colored and easily bleached in comparison with pulps that are produced by the other chemical-pulping processes. The strength is sufficient for such purposes as newsprint, magazine paper, greaseproof, glassine and fine papers. This process is also widely used to produce dissolving pulps, such as are employed in the manufacture of rayon and cellulose films of various kinds.

Hardwoods, containing appreciable amounts of resins and tannins, are at present considered not suited for this process. It is not usually feasible to digest mixtures of various species by this method. Also, it is not practical to recover the chemicals from the spent liquor of the calcium-base process, the most common of the sulfite processes. The recent development of magnesium-base and sodium sulfite pulpings with efficient chemical recovery systems has minimized the waste disposal and water pollution problems which are normally associated with the conventional calcium-base process. Furthermore, a wider number of species can be handled by these newer bases than can be done by calcium-base liquors.

*b. Soda process.* Caustic soda in solution is used as the digesting chemical. Soda pulp is used in the manufacture of printing and writing papers because of its desirable qualities of softness, absorbency, smoothness, opacity and bulk. The pulp yield is approximately 10 percent lower and the strength is less than that of sulfate pulp from the same wood. The chemicals in the spent cooking liquor can be recovered, thereby greatly reducing the problem of waste-disposal and improving the economy of operation.

*c. Sulfate process.* Caustic soda and sodium sulfide in solution are used as the digesting chemicals. Pulp yields up to 55 percent are obtainable. The unbleached pulp is suitable in the production of wrapping, bag papers and linerboards, because of its exceptional strength. The dark-colored pulp produced by this process requires multi-stage bleaching for the production of light colored papers.

With this process, it is generally possible to pulp mixtures of various species. A chemical recovery system, as in soda mills, is also an economic necessity in the sulfate process. Without a chemical recovery system, the cost of chemicals in the

soda and sulfate processes would be excessive. Chemical recovery also greatly lessens the waste-disposal problem.

3. *Semichemical methods*

There are a number of confusing terms that denote the field of pulping which lies between the usual chemical processes and the conventional groundwood process, but "semichemical pulping" seems to be the best and most widely accepted designation. Broadly defined, semichemical pulping signifies the subjection of wood chips to a relatively mild chemical treatment, followed by mechanical fiberization in an attrition mill. The yield and quality of these pulps lie between those of the mechanical and the chemical pulps. The waste disposal problem depends to a great extent on the availability of suitable chemical-recovery systems.

a. *Cold caustic soda.* The chips are soaked in caustic soda solution at normal atmospheric pressure and temperature for a few hours, after which, they are fiberized in attrition disk mills. Pulp yields up to 92 percent are attainable. The pulp is yellowish. Among its uses are for newsprint, toweling, corrugating, and insulating papers and building boards. Both high-density and low-density hardwoods can be handled by this method. Other attractive features are its relative simplicity in operation and smaller capital investment that is required as compared with other semichemical-pulping processes. The time of chip impregnation can be shortened by the use of hydrostatic pressure which effects, in seconds or in a few minutes, chemical impregnation of the chips. The process is adaptable to continuous operation.

*b. Neutral sulfite semichemical (NSSC).* The chips are partially digested with a neutral sulfite liquor under pressure and high temperature in rotary, vertical, or continuous digesters, after which, they are fiberized in attrition mills. The yield is normally from 70 to 85 percent. The unbleached pulp has a tensile strength close to that of the corresponding sulfate pulp and is preferably used for the manufacture of corrugating boards because of its excellent stiffness. The bleached pulp is suitable for glassine, greaseproof, printing and fine papers.

Chemical recovery systems have been developed for NSSC spent liquors. In addition, if an NSSC mill is operated with a sulfate mill, the NSSC spent liquor can be processed in the sulfate-recovery system provided that the ratio of sulfate pulp to NSSC pulp production is kept within certain limits.

*c. Semichemical pulps by the sulfate, soda or sulfite process.* Sulfate, soda, or sulfite-cooking liquors are used but the temperature, time, and amount of chemicals used are less than those for conventional chemical digestions. The pulp yield, 50 to 65 percent, is generally lower than those attained for other semichemical processes, but the power consumption for fiberization is lower. Sulfate and soda-semichemical pulps are used for linerboard, corrugating medium, and other types of paper boards. Semichemical sulfite pulp is used in newsprint.

Before pulp can be used for papermaking, it must undergo several treatments. The pulp must be screened to remove coarse particles and washed to removed adhering chemical solutions. Bleaching may be needed if the pulp is to be used for light-colored or white paper. To develop the required paper-strength properties, the pulp is beaten or refined in beaters, jordans, or conical or disk refiners. Additives like dyes, rosin, alum, and fillers, are usually added to the pulp furnish to impart specially desired properties in the finished paper.

*REFERENCES*: Much information about the manufacture of pulp and paper can be found in the numerous books on the subject, including the following:

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* * *

## TYLOSES IN WOOD

The pores or vessels [1] of some woods are sometimes partially or completely blocked with bladder-like protrusions aside from the gummy or chalky substances that frequently fill their cavities. These structures are actually outgrowths of adjacent parenchyma cells and are known technically as tyloses (from the Greek word "*tylos*" meaning "lump"). They gain entrance into the vessel cavities through the pits. During heartwood formation, differences in pressure may arise between the adjacent parenchyma cells and a vessel. Consequent-

[1] Pore is a term of convenience for the cross section of a vessel or vascular tracheid.

ly, the thin elastic membrane of a pit-pair between a wood parenchyma or wood ray parenchyma cell and a vessel or a tracheid may expand and grow, pushing out of the pit cavity and protruding far into the lumen of the vessel or tracheid, like a little bladder. A portion of the cytoplasm and even the nucleus involved, passes into this bladder-like extensions of the parenchyma cells.

A tylosis may remain small or become very large. First, small protrusions like soap bubbles may appear flanking a pore. These "tylosic buds" enlarge until they meet and a secondary tylosic bud appears. The size and shape of tyloses depend upon the size of the lumen of a tracheid or vessel into which they grow and in part upon the number of other tyloses present. In softwoods, tyloses are relatively small but in hardwoods, they frequently form bladder-like sacs of considerable sizes. Tyloses are sometimes spherical or they appear as elongated vesicles. A given cell may contain one or few to many tyloses growing from a parenchyma cell. They may develop only from occasional pit pairs or from as many pit pairs as there are between a vessel or tracheid and a living parenchyma cell. Tyloses may be arranged in uniseriate rows or in multiseriate rows as observed in the longitudinal sections. The extent to which the tylose wall increases in thickness also varies. A tylosic mass may resemble parenchyma cells with walls usually remaining thin and delicate or becoming wrinkled and partially collapsed in heartwood. Sometimes their walls may become thick-walled and lignified or even pitted when it comes in contact with other tyloses.

The contents of tyloses are in general, the same as those of the parenchyma cells producing them. Starch is common while resin, calcium crystals, and gums have also been observed.

Tyloses are of common occurrence in angiosperm [2] wood. They are characteristic of most dipterocarpaceous species and some members of the Sapotaceae. They may be constantly present in certain species but almost always absent in others. Tyloses are most abundant in heartwood but may also occur to some extent in the outer rings of the sapwood in species where they are normally present. Accordingly, there is a close correlation between the size and type of the ray-vessel pitting and the occurrence of tyloses. Furthermore, tyloses are formed where the width of the aperture of the pits from vessels to ray cells exceeds about 10 microns.[3] In the Leguminosae, where the pit apertures are generally absent, tyloses are normally absent except in *Robinia* sp. which is the most tylosed member of the family and which may have pits up to 16 microns. As a whole, the true wood vessels of Leguminosae species are plugged with gum.

The distribution of tyloses in wood is not determined by the type of wood, rate of growth, age of the plant, or by the habitat The variation in position, abundance, and vitality of parenchyma cells (either in the form of vertical or ray parenchyma) bears a definite relation to the development of tyloses. Wherever the paratracheal or vasicentric type of parenchyma is well developed, the tendency for marked tylose formation or gum production is very noticeable. In normal coniferous wood, tyloses arise chiefly from the parenchymatous cells of the medullary rays. They are formed in a similar manner as in hardwoods and, especially where the pits are large as in white pines.

Development of tyloses while it is normal, may also be induced in many plants by wounding. They may develop in the region near wounds on the surface of a tree trunk or in the region where a branch has been removed. Tyloses may also form in the sapwood of newly-felled trees as the logs lie upon the ground. However, tyloses that develop in this manner are usually "sporadic in occurrence and irregular in size and shape."

The nature, distribution and occurrence of tyloses in woods have some practical significance in wood utilization. A case in point is that of red and white oaks. The structure of these two species is practically the same, and yet red oak can not be used for tight *cooperage* because of its open vessels. In white oak the vessels are filled with tyloses, which makes it suitable for tight cooperage. To the cabinet-makers, tyloses act as a natural filler. As to the durability of the wood, tylosis is sometimes one of the factors considered. For instance, white oak in which tyloses are abundant is more durable than red oak whose vessels are almost devoid of tyloses. However, presence of tylosis does not necessarily increase the durability of wood. From the preservation viewpoint, it was found that the impenetration of preservatives in wood is, to some extent, ascribed to the presence of tyloses.

Experiments conducted by the Forest Products Research Institute on the treatment with creosote of 3 x 3 x 4 inches heartwood specimens of da-

[2] Angiosperm is one of the two subdivisions (the other being Gymnosperm) of the Spermatophytes of the Vegetable Kingdom. It embraces those forms in which the seeds are enclosed in an ovary, which may or may not discharge at maturity.

[3] A micron is a thousandth of a millimeter.

gang (*Anisoptera aurea Foxw.*), almon (*Shorea almon Foxw.*) and red lauan (*S. negrosensis Foxw.*) for two hours at 180 p.s.i. pressure and at 190 degrees F, showed that they were very difficult to treat. These species, as disclosed by the study, have corresponding tylosic occlusions of 73, 60 and 53 per cent, respectively. On the other hand, in the 10 species of *Dipterocarpus* also studied of which three were treated under the same conditions, the tylosic contents did not pose any serious problem in the penetration of wood preservatives. It is probable that the other *Dipterocarpus* species would behave similarly when treated with preservatives.

In the wood of conifers and in few angiosperms, there appear structures of resin canals from the proliferation of thin-walled epithelial cells.[4] The enlarged epithelial cells resemble tyloses but since they occur in a canal, that is, in an intercellular space and not in a vessel and do not grow through pits, they are appropriately designated as *tylosoids*. Tylosoids may, like tyloses, occasionally become thick-walled and sclerotic.[5] They are of no significance except that they may possibly enhance the durability of wood.

The presence of tyloses may be of taxonomic value but it is sometimes doubtful if their formation is a constant feature. Furthermore, they are normally absent in the sapwood. However, they have a greater diagnostic value in the Sapotaceae because their tyloses are pitted, contain crystals and have a characteristic shape.

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## PULPS AND THEIR METHODS OF PRODUCTION FOR NEWSPRINT MANUFACTURE

Newsprint, according to the Dictionary of Paper, is a generic term used to describe paper of the type generally used in the publication of newspapers. The furnish is largely made of mechanical wood pulp, with some chemical wood pulp. The term includes standard newsprint and also paper generally similar to it and used for purposes other than newspapers. The greater bulk of the furnish is composed of groundwood or mechanical pulp.

[4] Epithelial cells are secretory parenchymatous cells of the epithelium, the layer that surrounds an intercellular canal or cavity.

[5] Sclerotic refers or describes a strengthening element that is not markedly parenchymatous, but which has thick, often lignified secondary walls and which commonly lack a protoplast when mature.

Typical newsprint furnish are:

| | *Status* |
|---|---|
| 1. Groundwood (softwood)—70 percent<br>Unbleached sulfite or semi-bleached sulfate (softwood)—30 percent | commercial |
| 2. Groundwood (softwood)—40 percent<br>Chemigroundwood (hardwoods)—30 percent<br>Semi-bleached sulfate (softwood)—80 percent | commercial |
| 3. Groundwood (softwood)—80 percent<br>Semi-bleached sulfate (softwood)—20 percent | commercial |
| 4. Groundwood (softwood)—75 percent<br>Unbleached sulfite and partially bleached sulfate (softwood)—25 percent | commercial |
| 5. Australian Newsprint<br>Groundwood (Eucalypts hardwood)—60 percent<br>Cold-soda pulp (Eucalypts hardwood)—22 percent<br>Bleached sulfate (*Pinus radiata* softwood)—18 percent | commercial |
| 6. Swedish Newsprint<br>Groundwood (softwood)—75 percent<br>Sulfite (softwood)—75 percent<br>NSSC Birch (hardwood)—10 percent | commercial |
| 7. FPRI-RP Newsprint<br>NSSC gubas (unbleached)—60 percent<br>Sulfite gubas (bleached)—10 percent<br>Groundwood (softwood)—30 percent | experimental |

In the United States and Canada, groundwood pulp is made of spruce (*Picea spp.*), balsam (*Abies balsamea*), hemlock (*Tsuga spp.*), pine (*Pinus spp.*), poplar (*Liriodendron tulipifera*) and birch (*Betula spp.*). In New Zealand, groundwood pulp is made mostly of Radiata (Monterey) pine (*Pinus radiata*). Australia, on the other hand, makes groundwood pulp of eucalypts (*Eucalytus spp.*) which are hardwoods. In the Philippines, groundwood pulp may be produced from Benguet pine (*Pinus insularis*), Mindoro pine (*P. merkusii*), gubas (*Endospermum peltatum*), taluto (*Pterocymbium tinctorium*), lumbang (*Aleurites moluccana*), kupang (*Parkia javanica*), Kaatoan bangkal (*Anthocephalus cadamba*), ilang-ilang (*Cananga odorata*), and other light-colored, medium-density woods. The first two local species mentioned are softwoods while the rest are hardwoods.

*The groundwood method*

Groundwood pulp making is purely a mechanical process. The pulp contains all the components of the original wood, excluding the bark and some water soluble constituents. It is easy and cheap to make groundwood pulp, if cheap electric or water power is available. Its strength is inferior compared to other pulps, but it has a wide application in the production of papers that are put to service for a short time only, e.g., newsprint and mimeograph papers which deteriorate after sometime on exposure to air and sunlight.

Pulpwood brought to the mill is debarked and cut into desired lengths. Grinding is, generally, done with water spray to remove or minimize the heat of friction developed between the grindstone and the wood bolts and to float the fibers away. The grinding is done parallel to the length of the wood bolts. This has the effect of giving longer fibers by tearing the fibers from each other rather than by right angle or vertical cutting action across the length of the fiber.

There are two principal types of grinders, the continuous and batch or intermittent. Batch grinders are the earlier model. A lever or screw arrangement is employed to produce the necessary thrust to push the wood bolts against the revolving stone. In more advanced designs, a hydraulically operated pressure foot is used.

There are two forms of batch grinders, the pocket type and the magazine type . The *pocket type* may have either 2, 3, or 4 pockets that are essentially the same in construction and located about the semi-circular periphery of the grinder. The grinder consists of a central grindstone (137 to 157 cms.

in diameter) that is mounted on a steel shaft and revolves inside a steel casing. A hydraulic cylinder with a plunger is an accessory to each chamber or pocket. This cylinder operates a ram or plunger which forces the pulpwood against the revolving stone which may be natural or artificial.[1] Periodically, it is given a suitable type of burr by properly dressing its surface which is one of the principal factors in determining the quality of groundwood pulp. Cooling and removal of the fibers are effected by means of a spray of "white" water that is directed to the stone surface. The wood bolts, used for this type of grinder, are usually 24 to 32 inches in length.

The *magazine type*[2] has two pockets that are located almost directly opposite each other. A magazine, where the logs are stored, is located between the pockets and above the grindstone. When the hydraulically-operated pressure foot of the magazine grinder is withdrawn for a new charge, the wood bolts from the magazine automatically fall into the pocket. When the pocket or chamber space is filled with wood, the arm reverses and presses the wood against the revolving stone.[3] At the same time, more of the surface of the stone is usefully and effectively employed by increasing the width of the grinder. Wood bolts or blocks fed into this grinder are usually 48 inches in length. Magazine grinders are normally installed in pairs with a synchronous motor.

Continuous grinders, as the name implies, feed the wood bolts to the grindstone without interruption. An example of this is the "Kamyr" which is used principally in Europe. "Warren" and "Voith" are also widely used in Europe. The "Tidmarsh" and "Roberts" ring grinders are widely used in Australia and the U.S.

The pulp slurry from the grinders goes to a stock sewer under the grinders and a sliver screen where most fiber bundles are removed. The pulp slurry, freed from fiber bundles, goes to a screened-stock pit from where it is pumped to the fine screens. The fines or pulp accepts, passing through these screens, are partially dewatered in thickeners or deckers to give the commercial wet-lap pulp. The oversized material from the screens are refined in disk refiners and returned for rescreening. The water overflow from the thickeners contains about 15 to 20 percent of the original fibers and is known in the industry as the "White" water.

[1] Artificial stone normally gives better performance.
[2] The "Waterous" is a magazine grinder while the "Great Northern" is a variation of the magazine grinder.
[3] Very large stones, usually 62 inches in diameter, are employed.

*The chemigroundwood process*

A more recent development in the production of pulp for newsprint manufacture is the chemigroundwood process which is of particular interest because it is specially applicable to hardwoods. The debarked logs are impregnated with a neutral sulfite liquor (mixture of sodium sulfite and sodium bicarbonate) by vacuum and pressure treatment in a closed vessel. The chemically-treated logs are ground in the same manner as in the conventional groundwood process. The pulp yield is up to 90 percent.

A modification of this process is known as the chip-chemigroundwood process. The log is chipped to about 1.6 cm. chips. These chips are treated with neutral sulfite liquor and digested at high temperature. After digestion, the treated chips are refined in disk refiners. The pulp yield ranges from about 87 percent to 95 percent.

The pulp produced by this method has a uniform separation of the woody tissues. The typical fiber bundles and broken fibers of ordinary groundwood pulp are practically absent. The strength of the pulp is excellent and the power requirements are less.

*The cold-soda process*

Cold-soda pulp from hardwoods is becoming an important blending material for newsprint manufacture. In Australia, about 22 percent of the total furnish is made up of cold-soda pulp from eucalypts. In Japan, cold soda pulp is being used more and more for newsprint making. The process consists essentially of soaking the chips in caustic-soda solution at room temperature and at atmospheric pressure for 2 or 3 hours, or at elevated pressure for a few minutes. After soaking, the chips are defiberized in attrition mills.

By this process, the pulp yield is comparable to that of the chip-chemigroundwood process. The pulp is slightly dark colored but can be easily brightened by a single stage bleaching using zinc hydrosulfite. The pulp strength is higher than that of the groundwood pulp. Furthermore, this method is applicable to low density and medium density hardwoods.

*Newsprint from Philippine woods*

The chip-chemigroundwood has been employed in the production of experimental newsprint from Philippine woods. Light-colored woods (gubas, taluto, lumbang, etc.) were chosen for this purpose. The logs were reduced to 1.6 cm. chips and were treated with neutral sulfite liquor (the

(*Continued on page* 136)

# Campus Notes

## SIXTY-TWO STUDENTS EXPECT TO GRADUATE

The College of Forestry is expecting some sixty-two students to graduate at the end of the second semester this year, twelve of whom are to be awarded the Ranger Certificate on April, 1964, during the Moving-Up Day convocation to be held at this College. Fifty are to be conferred the degree of Bachelor of Science in Forestry on May 3, 1964, during the general commencement exercises to be held at the University of the Philippines, Diliman Campus. The candidates for graduation are the following:

*For the Ranger Certificate*:

1. Ancheta, Severino T
2. Basas, Heracleo A.
3. Bautista, Luisito G.
4. Cachero, Tranquilino P.
5. Flores, Federico G.
6. Garcia, Avelino I.
7. Garcia, Pablo G.
8. Lavilla, Reynaldo L.
9. Manglinong, Salvador D.
10. Medenilla, Pablito Jr. A.
11. Tanzo, Carlito P.
12. Udarbe, Aquiles C.

*For the degree of Bachelor of Science in Forestry*:

1. Abugan, Benigno Jr. G.
2. Azaula, Lorenzo P.
3. Bajo, Artemio Q.
4. Banjongsilp, Boonliang
5. Benzon, Jesus P.
6. Calixto, Pedro V.
7. Camero, Rogelio A.
8. Canave, Modesto O.
9. Capiton, Amando T.
10. Castillo, Cenon M.
11. Clemente, Francisco A.
12. Dacumos, Cresenciano Q.
13. de la Cruz, Damaso F.
14. de la Rosa, Rogelio M.
15. Duldulao, Anacleto C.
16. Enrile, Florentino B.
17. Eslava, Felix Jr. M.
18. Ewoc, Cornelio G.
19. Federizo, Antonio B.
20. Fernandez, Virgilio A.
21. Ferrer, Florentino I.
22. Galo, Crisanto A.
23. Gatan, Florante M.
24. Gendrano, Oscar A.
25. Glori, Antonio V.
26. Gonzales, Jose A.
27. Hamada, Oscar N.
28. Llana, Mariano Jr. S.
29. Lubrin, Andres C.
30. Manaig, Luis P.
31. Morales, Danilo M.
32. Nacino, David B.
33. Obay, Eufemio E.
34. Ordinario, Buenaventura M.
35. Ordinario, Ernesto B.
36. Padre, Dominador G.
37. Padrones, Conrado Jr. P.
38. Pastor, Agustin D.
39. Principe, Antonio G.
40. Reyes, Lope D.
41. Reyes, Serafin D.
42. Salazar, Pedro C.
43. Rojas, David M.
44. Serna, Arsenio B.
45. Sison, Anastacio B.
46. Sumajit, Bonifacio S.
47. Tandoc, Maximo V.
48. Vergara, Ester T.
49. Wandisan, Carlos L.
50. Wongwilai, Prayoon

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## SEMINAR ON GROWTH

The Department of Forest Resources Management of the U.P. College of Forestry sponsored a seminar on growth of trees and stands and its relation to wood quality, last Jan. 16, 1964. The seminar was held at the Forestry Technology Building, of the U.P. College of Forestry. It was attended by personnel of the Bureau of Forestry, Forest Products Research Institute, and some Lumber Companies.

Prof. Caesar Recto one of the speakers said that the interest in growth is obviously to determine how

much we can get from our forest. The usual way of determining the amount of growth is by recurrent inventory using permanent sample plots. The hardship of this method is the maintenance of the sample plots. Keeping these sample plots out of destruction by "kaingin" making is the biggest problem. This problem of maintaining sample plots was advocated by the personnel of the Bureau of Forestry who reported that since before the Second World War they had been doing research on growth but unluckily all their plots were destroyed during and after the war. That is the reason why the Bureau of Forestry was able to present only a four-year old data on growth research.

The Bureau of Forestry personnel presented the result of their 4-year old research with the percentage growth of the species found in the different climatic types of the Philippines. In the first climatic type, the percent growth is 1.87%, second 5.16%, third 2.10%, and the fourth climatic type is 5.19%. The average percent growth all over the Philippines is 3.58%. They also gave percent growth data according to regions. For Luzon 1.47%, Visayas 4.01%, and Mindanao 5.43%. Based on these data, they gave the volume growth per hectare varying from 6 to 10 cubic meters depending on the density of the stand.

Dr. Hugo Kraemer, a visiting professor from the State University of New York said that the strength of the wood vary with the rate of growth. For the ring-porous species, the strength increases with increase in the rate of growth. On the other hand, for coniferous species, the strength decreases as the rate of growth increases. His report was based on his research in the United States.

*A. Duldulao*

* * *

## OFFICERS OF CLASS ORGANIZATIONS

FRESHMEN:

Laurentino Vilar .... *President*
Narciso Mindajao .. *Vice-President*
Abraham Velasco ... *Secretary*
Arthur Garcia ..... *Treasurer*
Mariano Machacon .. *Auditor*
Leopoldo Bautista .. *Business Manager*
Baldomero Laccay .. *Press Relations Officer*
Allen Torrenueva .... *Representative to the SBO*
Riveracion Nisperos .. *Muse*

SOPHOMORES:

Crisostomo Vilar .... *President*
Celso Diaz ..... *Vice-President*
Felipe Pastores .... *Secretary*
Albert Angel ..... *Treasurer*
Felipe Calub ..... *Auditor*
Felix Ordinario ..... *Business Manager*
Tomas Castillo ..... *Press Relations Officer*
Jaime Dimaano ..... *Athletic Manager*
Diosdado Marfil .... *Representative to the SBO*
Josefino Ammalingan . *Sergeant at Arms*
Amado Ramos ..... *Sergeant at Arms*

JUNIORS:

Francis Mabanag ... *President*
Elpidio Padre ..... *Vice-President*
Eufemia Tamolang .. *Secretary*
Valerio Rabanal .... *Treasurer*
Reynaldo dela Cruz . *Auditor*
Prudencio Afalla ... *Business Manager*
Francisco Rendorio .. *Press Relations Officer*
Oscar Oliveros ..... *Representative to the SBO*
Magdaleno Ellazar .. *Sergeant at Arms*
Nelson Mercado .... *Sergeant at Arms*

SENIORS:

Cresenciano Dacumos *President*
Pedro Salazar ..... *Vice-President*
Ester Vergara ..... *Secretary*
Carlos Wandisan .... *Treasurer*
Lorenzo Azaula .... *Auditor*
Jose Gonzales ..... *Business Manager*
Conrado Padrones, Jr. *Press Relations Officer*
Anacleto Duldulao .. *Representative to the SBO*
Andres Lubrin ..... *Sergeant at Arms*

* * *

## FACULTY DOINGS ON BULLETIN

Romulo del Castillo of the Department of Forest Resources Management was a member of the committee which prepared and published the bulletin Regional Volume Equations and Tables for Philippine Timber Species. A cooperative project of the Forest Management and Forest Research divisions of the Bureau of Forestry, UP College of Forestry, and the US AID, the bulletin directly gives the user the volume of timber species at standard measurements.

## ON GEODESY AND PHOTOGRAMMETRY

Professor Caesar Recto, College secretary, and Juanito Lamanilao, head of the Forest Resources Management Department, were named members of

the Ad-Hoc Committee under the Board of Technical Surveys and Maps, to study, evaluate, and make recommendations on the establishment of a Training Center for Applied Geodesy and Photogrammetry in the Philippines.

## ON THE LAND REFORM

Professor Juanito Lamanilao is a member of the Agricultural Land Reform Staff that is working in the Land Classification project of the Land Reform Program.

He was recommended by Dean Gregorio Zamuco upon the request of National Economic Council Chairman Sixto Roxas III for a trained Forester.

## FACULTY SPEAKERS

Professor Benito Lim of the Forestry Extension and Information Department was the discussion speaker in a seminar on "Technical Reporting" at the Forest Products Research Institute, last January 8, 1964.

Then, on January 28, 1964, at the monthly cultural affair sponsored by the Humanities Department of the U.P. College of Agriculture, Professor Lim also spoke on "Zen Buddhism."

* * *

Armando Villaflor of the Department of Forest Resources Management was featured in a 30-minute program over DZBB's "Forests Build the Nation," January 26, 1964.

Mr. Villaflor discussed the status and importance of the plywood and veneer industry in the Philippines.

* * *

## FORESTRY CONSTITUTION AMENDED; LOCAL COUNCIL GIVEN PERMANENT OFFICE

The constitution of the College of Forestry Student Body was amended in a mass meeting at the forestry auditorium last January 16, this year. Among the important changes ratified by the body were, the holding of two mass meetings only instead of the regular monthly meetings, the addition of an article which provides for the support of an exclusive student publication by the SBO and a partial support to a semi-technical or purely technical paper, and the creation of the position of Business Manager.

The resolution on the adoption of the "Forestry Notes", name of the exclusive student organ, and an appeal to President Diosdado Macapagal to give priority to forestry graduates in his appointment of future forestry directors were not taken up in the meeting due to lack of time.

Meanwhile, for the first time in the history of the College of Forestry, Dean Gregorio Zamuco approved the granting of a permanent office to the local Student Council. This has been made possible through the initiative of Modesto O. Canave, SBO president and Andrew W. Bacdayan, adviser.

* * *

## NATIONAL STUDENTS LEAGUE MEET AT LOS BAÑOS

The Student Councils of the Colleges of Agriculture and Forestry played hosts to the delegates of the newly organized National Student League in their meeting and reunion held last Feb 2, at the Seniors' Social Garden of the College of Agriculture. Panfilo Tabora and Modesto Canave, presidents of the Colleges of Agriculture and Forestry student body respectively, led in welcoming the NSL delegates from the Philippine Normal College, the Phiippine College of Arts and Trades, and the Philippine College of Commerce. The University of the Philippines was represented by Benjamin Muego, University Councilor of the U.P. Student Council.

A short musical program participated by the Aggie and Forestry students was held in honor of the NSL delegates. After the program, both hosts and the honorees made a tour of the famous International Rice Research Institute (IRRI), Jamboree Site, and the Forest Products Research Institute (FPRI).

* * *

## FSBO RESOLVED ITS STAND ON B.F. DIRECTORS APPOINTMENTS

A resolution appealing to President Diosdado Macapagal to give priority to forestry graduates in his appointment of future directors of forestry was unanimously approved by the College of Forestry Student Council in a special meeting last Feb. 12, this year. Among other reasons, the resolution cited the general demoralization in the ranks and files of foresters and would-be foresters resulting from the previous designations by the president of four forestry directors who are not graduate of forestry. Moreover, the resolution denounced the said appointment as an utter disregard of the seniority and merit system.

Meanwhile, the Forestry Council have agreed to send copies of the said resolution to President

Macapagal and to the U.P. Student Council at Diliman for its endorsement.

* * *

## FUE OFFERS NEW COURSES

New courses on quality control and wood utilization research in forest utilization engineering are now being offered at the College of Forestry at Los Baños. Said courses, according to Prof. Rodolfo Yaptengco, head of the Forest Utilization Engineering Department of the College, have been added to the revised curriculum to meet the acute need for wood products engineers by the local lumber industries. Due to lack of highly trained men to conduct wood research, the professor said that the full uses of wood are barely exploited.

The new curriculum for the forestry course has been presented to the leading lumbermen of the country during the 3rd National Convention of Log Producers and Wood Processors held sometime last year at Zamboanga City. It was Prof. Rodolfo Yaptengco who explained the significance of the new forestry curriculum and also read his paper entitled, "The Role of the U.P. College of Forestry in the Industrial Revolution of Philippine Wood Industries."

Meanwhile, Dean Gregorio Zamuco announced recently, his plan of expanding the wood utilization engineering courses to the graduate school level.

* * *

## GARCIA DESIGNATED ADMINISTRATIVE ASSISTANT

Ruben Garcia, Professor of History and Psychology at the College of Forestry, U.P. was recently designated Administrative Assistant for business affairs of the College by Dean Gregorio Zamuco. As concurrent chairman of the Makiling Development Committee, Prof. Garcia, in an interview, said that in consonance with the establishment of a botanical garden at the Makiling forest, a delineation of the boundary of the forest will be conducted soon by personnel from the Bureau of Lands.

Prof. Garcia's significant accomplishment as Administrative Assistant is the release of ₱15,000 by the U.P. Board of Regents for the relocation survey of the Makiling Forest (formerly Makiling National Park). Emphasizing the importance of the survey, the professor said that the relocation of the boundaries of the Makiling Forest will further assure the College of Forestry of its legal ownership of the controversial forest. He also added that the relocation of the boundaries of the 4-thousand hectares area will pave the way for large scale improvements.

* * *

### MAKILING NATIONAL PARK

College of Forestry Water System

The new water work system in the College of Forestry Costing ₱60,000 is about to function. The system will be opened after checking of leaks is made.

Prospective water users are informed to be ready with their water meters now so that as soon as the chlorometer arrives, they will be provided with sufficient supply of water.

The source of water of this system is the upper most spring of Maralas.

—D. Marfil

* * *

### NEW APPROPRIATIONS

The College of Forestry was able to get an appropriation of ₱15,000 from previous income of the Makiling National Park, it was learned from Prof. Agustin Pascua recently. The income was derived from rubber latex, timber and minor forest products, gate collections, swimming pool fee, and rents collected for the use of the indoor and open pavilions.

—D. Marfil

* * *

### ADDITIONAL FACILITY

A new additional facility to the office of the Makiling National Park is a "Topographic Map" of Mt. Makiling of scale 1:50,000. Its uses are for base mapping, Inventory works, surveying, etc.

This map was made available through the efforts of Dr. Hugo Kraemer, Prof. Agustin Pascua, and Prof. Romulo del Castillo.

—D. Marfil

* * *

Department of Forest Resources Management

### NEW COMMITTEE

The "Committee to Standardize Design of Growth Plots for the Philippines" was recently created under the sponsorship of the Department of Forest Resources Management, College of Forestry. The objective of the committee is to make the comparable growth of Philippine forest, and its purpose is as it is titled.

The committee composses four C.F. faculty members, four B.F. Personnels, and one from the

AID. The faculties are Professors Juanito Lamanilao, Leonardo Angeles, Florencio Mauricio, and Romulo del Castillo, chairman. The B.F. personnels are Foresters C. Arellano, I. Siapno, M. Nastor, and B. Agaloos. Dr. M. Bryan, the AID Forestry Adviser is representing AID.

—D. Marfil

Department of Arts and Sciences

## ADDITION TO COLLEGE HERBARIUM

One hundred copies, duplication of mountain specimens, were turned over to the College Herbarium last February. The specimens are great importance to the students because some of these are not found in the Mt. Makiling vicimity.

Prof. Lucio Quimbo, head of the Department of Arts and Sciences, said that there is exchange agreement between the National Herbarium and the College of Forestry Herbarium of specimens. This agreement facilitates both mentioned institutions to make bigger collection of the Philippine species.

—D. Marfil

## PATHOLOGY LABORATORY COMPLETED

The pathology laboratory of the College of Forestry was completed last February thru the initiative of Dr. Savel Silverborg The equipment added which were purchased from the SUNY Contract funds are five incubators, two refrigerators, one oven, chemicals, and laboratory glasswares.

Meanwhile, Dr. Silverborg and Mr. Enriquito de Guzman are preparing to start with a research work this summer concerning diseases of lumbang and Eucalptus. The research is a joint project of the College of Forestry and the Nasipit Lumber Company.

—D. Marfil

## COMMENTS ON "STUDENT DISCIPLINE" IN THE COLLEGE OF FORESTRY"

In a heterogenous campus such as ours, it is expected that the student populace possesses varied traits and characteristics, be it either good or bad. There is nothing strange about this, since every individual is bestowed with tastes and attitudes toward anybody or anything else in this world.

Such of the aforementioned traits depicts the character and impression of a particular group. To a group therefore who always do worthwhile and aceptable jobs and actions and never create unbecoming ones, it is supposed to be commended and thus it is called a good group. To one who does otherwise, is a bad group. And now if we come to think of our own, where do we belong?

In an interview with three local professors who are immediately concerned with Student Discipline and the Forestry Residence Hall Head, it was found out that in general, the students of this college are peaceful and well-behaved. This is shown by the fact that for the past several years, there had been no serious trouble committed by the students. Of course there were some minor infractions of the campus rules and regulations committed, such as drunkenness, noisiness, coming home beyond the curfew hour, etc., but once a student is warned for committing any of the above, he is ninety-five per cent sure not to do the offense again he had done mistakably.

The record of the Students Welfare and Discipline Committee, which is being presided over by Professor Armando Villaflor reveals that during this school-year very few and very minor violations had been committed. The College of Forestry in particular, and the University in general must be proud about this therefore. However, this is not yet the end of it. There are more and many more years to come, and thus we don't know what consequences are ahead of us.

So to the present studentry, here is a challenge to you, "can you maintain the present atmosphere of the college throughout?"

## SBO HOLDS CHRISTMAS PROGRAM

Yearly, the students of the College of Forestry gather together to celebrate Christmas, to let everyone feel the joy it brings to mankind. Like the past Christmas celebrations, there were songs, skits, and tableau. But last time there was a difference. The celebration was made colorful and entertaining with the participation of foreign students.

The foreigners four of them are men and two are women who participated are at present students of the College of Forestry and College of Agriculture. They are from Thailand. They danced their native folkdances as they themselves sang and played the music. Attired on their brightly colored native costumes, they played their musical instruments more or less the same as the native Filipinos of the past. This reminds us again that the peoples of Asia had more or less a common identity.

—A. Duldulao

## FOREST EXPERIMENT STATION ACTIVITIES

Forester Conrado B. Tadeo, forester incharge of the Forest Experiment Station, disclosed that they are working on different fields of forestry. At present, they are conducting experiments on forest management, silviculture, forest reclamation, and forest grazing. They have 24 projects on forest management, 15 on silviculture, 3 on forest reclamation, and 5 on forest grazing.

On forest management, research is being done on rate of growth, survival, and yield of residuals in logged-over areas. In the silviculture side, in the effect of the release of poles and standards from "wolf" as well as defective trees left uncut in the logged-over areas. They are also conducting research on growth and survival of forest seedlings, dwarfing of forest trees, bare root planting of Dipterocarp species, vegetative propagation and timber stand improvement in logged-over areas as well as in mongrove swamps.

In grazing, their projects are distributed mainly in the island of Mindoro. Their primary objectives are: (1) to make the most efficient use of forage for the production of livestocks and wildlife (2) to find out how they could produce the maximum forage for a range land which is producing less than its optimum productivity and at the same time to encourage ranches to improve the watershed value of their range land for the metigation of destructive runoff and erosion.

Their research in forest reclamation is a sort of a short range experiment simply to find out if they could be successful in raising mangrove species in foreshores and to find out the species that could be successfully grown to cover same.

Other projects they have at present are on tree improvements based on the principal species of Dipterocarpaceae and also on graze turn, the propagation of grasses, exotic as well as endemic which maybe used for their grazing studies. They are also conducting experiments on budding and grafting of Mahogany (*Sweitenia macrophylla* ENDL.), Bagtikan (*Parashorea plicata* Brandis), White lauan (*Pentacme contorta* (Vid.) Merr. & Rolfe) and Mayapis (*Shorea squamata* Dyer). No successful result has been obtained yet so that replications are being made from time to time.

They are also conducting germination test on exotic species at present as well as experiments on erosion and sedimentation on watershed management.

—A. Duldulao

DEAN GREGORIO ZAMUCO
College of Forestry

CRESENCIANO Q. DACUMOS
Iligan City
**Bachelor of Science in Forestry**
Ranger Certificate, 1952
Bureau of Forestry Pensionado
President, Senior Class Organization
Member Makiling Literary Club
Member, Pensionado Club
**Staff** member, Forestry Leaves

PEDRO SALAZAR y GARGANILLO
Tayug, Pangasinan
Bachelor of Science in Forestry
Ranger Certificate—(1933-1935)
R.A. Pensionado (4 semesters) (1962-1964)
Second Honor: Oratorical Contest (1933)
Vice-Pres., S.B.O. (1962-'63)
Vice-Pres., Senior Class Org.—(1963-1964)
*Member*:
Beta Sigma Fraternity
Makiling Literary Club
PGEA
U.P.C.F. Pensionado Club

J. D. LAMANILAO
*Adviser*

BENIGNO ABUGAN JR. y GARCIA
Banua Rest House, Pagudpud, Ilocos Norte
**Bachelor of Science in Forestry**
Cadet Officer, UP Los Baños ROTC Unit
Auditor General, Vanguard Fraternity (Los Baños Chapter)
*Member*:
UP National Vanguard Fraternity
UP Los Baños Folk Art Society (1962-1963)
UP Student Catholic Action (1960-1964)

LORENZO AZAULA y POTES
Jose Rizal St., Polillo, Quezon
**Bachelor of Science in Forestry**
Auditor, Senior Class Organization (1963-1964)
Business Manager, U.P. College of Forestry Chess Club (1963-1964)
*Member*:
Alpha Phi Omega Fraternity (Theta Chapter)
Forestry Residence Hall Assn.
Vigilance Committee (1963-1964)

BOONLIANG BANJONGSILP
Royal Forest Department
Bangkok, Thailand
Business Manager, Pensionado Club, U.P.C.F. Phil.
Treasurer, Thai Students' Organization in the Phil.
Associate in Forestry (1953)
B.S.F. (1964)

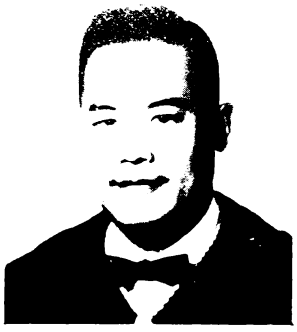
BASA, VIRGILIO
Bayombong, Nueva Vizcaya
Bachelor of Science in Forestry
Auditor—Junior Class Organization
*Member*:
Forestry Forensic Club
Forestry Leaves Staff
Forestry Softball Team
U.P.S.C.A.
YMCA

BAJO, ARTEMIO Q.
Bintawan, Villaverde, Nueva Vizcaya
*Member*:
Forestry Softball Team (1961-64)
Forestry Soccer Team (1961-63)
Forestry Volleyball Team (1962-63)
UP CAFSCM
U.P. Tumbling Delegate to the University Festival Fair (1960)
YMCA Forestry Chapter
Forestry Track and Field Team (1963-64)

JESUS PALMA BENZON
General Luna St., Vigan, Ilocos Sur
**Bachelor of Science in Forestry**
Advance ROTC Graduate—1962
Gold Medalist, Most Outstanding UPSCA—1960
Efficiency Gold Medalist ROTC —1960
Duty Gold Medalist, Advance ROTC —1962
President, UPSCA, Los Baños Unit, 1962—1963
Finance Officer, U.P. Vanguard Fraternity—1962-'63

TOMAS BINUA y MACABINGUEL
2155 Oroquieta St., Sta. Cruz, Manila
Grand Princep, U.P. Beta Sigma Fraternity (1962-1963)
President, UPCF Speech & Dramatics Club (1962-1963)
Chairman, UPSCA Forestry Chapter (1962-1963)
Vice President, UPCF Student Body Organization
Member, Society of Filipino Foresters (1955-1956)
Representative, UPCF Pensionado

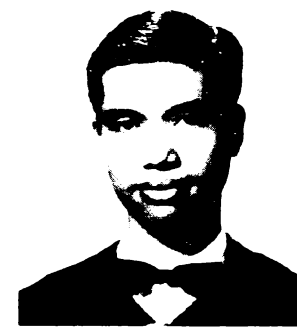
ROMEO B. BRIONES
Anakan, Gingoog City
**Bachelor of Science in Forestry**
Prime Chancellor, Alpha Phi Omega Int'l. Fraternity (1963-'64)
Keeper of the Rolls, Alpha Phi Omega Int'l. Fraternity (1962-63)
Secretary—UPSCA (1962-'63)
Councilor—Forestry Residence Hall Assn. (1961-'63)
Member—U.P.C.F. Forensic Club
U.P.C.F. Chess Club



CAC, MARIANO B.
Narvacan, Ilocos Sur
Bachelor of Science in Forestry
Member, B.F. Pensionado Club
Sr. Forester, Bureau of Forestry

PEDRO CALIXTO y VEGA
Vintar, Ilocos Norte
Bachelor of Science in Forestry
Entrance Scholar, First Semester (1960-1961)
Bureau of Forestry Pensionado (six semesters)
Second Best Debater, Forest Administration Class Debate (1963-1964)
Auditor, Sophomore Class Org., (1961-1962)
Fellow Whip, Zeta Beta Rho (1962-1963)
Sgt.-at-Arms, S.B.O. (1962-1963)
Treasurer, Junior Class Org. (1962-1963)

CAMERO, ROGELIO A.
Bani, Pangasinan
Entrance Scholar, 1960
*Member*:
Zeta Beta Rho Fraternity
UPSCA Forestry Chapter



MODESTO O. CANAVE
Bugallon, Pangasinan
Bachelor of Science in Forestry
Ranger Certificate (1954)
President—FSBO (1963-'64)
President—FRH Assn. (1963)
Service awardee—(1963)
Beta Sigma Fraternity
Chamberlain—Beta Sigma Frat.
Member, Pensionado Club

ARMANDO CAPITON y TARRA
Janiuay, Iloilo
Bachelor of Science in Forestry
Prefect: Sodality of Our Lady
Member: Forestry Softball Team

DAMASO F. DELA CRUZ
Calvo Street, San Nicolas, Pangasinan
Bachelor of Science in Forestry
Ranger Certificate—1952
B.F. Pensionado (4 Semesters)
Bus. Manager, Makiling Literary Club (1963-'64)
*Member*:
U.P.C.F. Pensionado Club
Forestry Leaves Section Editor (1964)

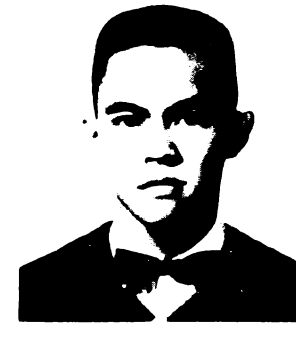
SANCHO DE RAMOS y GONZALO
Pañgil, Laguna
Bachelor of Science in Forestry
Member, Beta Sigma Fraternity

DULDULAO, ANACLETO C.
Barbarit, Magsingal, Ilocos Sur
Bachelor of Science in Forestry (BSF)
Entrance Scholar—1960-1961
B.F. Scholar—4 semesters—1962-1964
College Scholar—2 semesters—1963-1964
Vice Pres., Junior Class Organization, 1962-1963
Rep. to F.S.B.O.—Senior Class Orgn. 1963-64
Member, Zeta Beta Rho Fraternity
Makiling Literary Club

FLORENTINO ENRILE y BACANI
119 del Pilar St., Cabanatuan
Bachelor of Science in Forestry
Ranger Certificate (1960-1961)
Business Manager, Freshman Class
Fellow Gatekeeper, Upsilon Sigma Phi
*Member*:
Forestry Chess Club
Palay Growers' Ass'n.
Nueva Ecija Varsitarian

FELIX ESLAVA Jr. y MANANDAG
Natividad, Pangasinan
Bachelor of Science in Forestry
Sgt.-at-Arms—Junior Class Org.
*Member*:
Forestry Chess Club
Forestry Leaves Staff
Forensic Club
Makiling Literary Club
Zeta Beta Rho Fraternity

FLORENTINO I. FERRER
Bagumbayan Sub-Division, Naga City
Bachelor of Science in Forestry
B.F. Pensionado (4 semesters)
Vice-Pres., Forestry Residence Hall Assn. (1962-1963)
P.R.O., F.S.B.O. (1963-1964)
P.R.O.—Makiling Literary Club
Member, Beta Sigma Fraternity
—Pensionado Club (1962-1964)
—PGEA
—ROLP
—Society of Filipino Foresters



GENDRANO, OSCAR A.
San Vicente, Gumaca, Quezon Prov.
Supreme Fellow, Zeta Beta Rho Fraternity
President, Junior Class Org. 1962-63
Editor, Forestry Leaves, 1st sem. 1963-64
Associate Editor, Forestry Leaflets
Bureau of Forestry scholar—six semesters
Editor, *The Zetan*

ANTONIO GLORI y VILLAMOR
Bangued, Abra
Bachelor of Science in Forestry
*Scholarship*:
Entrance scholar—1st semester (1960)
B.F. scholar—8 semesters (1960-1964)
Member, Zeta Beta Rho Frat.
Makiling Literary Club
Associate Editor, Forestry Leaves
Best declaimer, Smokers' Rally (1962)
Best debater, Forest Administration Class (1963-1964)

JOSE GONZALES y ABRENA
Villasis, Pangasinan
Bachelor of Science in Forestry
Ranger Certificate (1952)
B.F. Pensionado (4 semesters)
Art Editor, Forestry Leaves (1951-52)
Auditor Freshman Class (1950-51)
Business Manager, Senior Class (1963-64)
Fellow Bursar Zeta Beta Rho Fraternity (1962)
Sgt.-at-Arms—FRH (1962-63)
Sgt.-at-Arms—SBO (1951-52)
Sgt.-at-Arms—SBO (1963-64)
*Member*:
Makiling Literary Club

MARIANO LLANA Jr. y SONICO
Cabugao, Ilocos Sur
Bachelor of Science in Forestry
Secretary, Freshman Class Organization—(1960-'61)
Member: Alpha Phi Omega Fraternity
—Forestry Chess Club
—Forestry Forensic Club
—Forestry Residence Hall Assn.
—Forestry "Y" Club

LUBRIN, ANDRES C.
Hillside, John Hay Air Base
Baguio City
Member, Makiling Literary Club

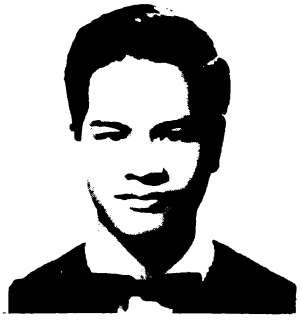
LUIS P. MANAIG
Bay, Laguna
Ranger Certificate (1961)
Lianga Bay Logging Company Scholar, Second Semester (1963-'64)

DANILO MORALES y MANAY
Parian, Calamba, Laguna
Bachelor of Science in Forestry
*Member*:
Forestry Basketball Team
Forestry Chess Club
Vigilance Committee

DAVID, NACINO Jr. y BALAIS
Aliaga, Nueva Ecija
Bachelor of Science in Forestry
Member, UPSCA

EUFEMIO OBAY y ESTRADA
Bayombong, Nueva Vizcaya
Bachelor of Science in Forestry
Ranger Certificate (1953)
B.F. Pensionado
Sgt.-at-Arms U.P.C.F. Pensionado Club
Councilor, College of Forestry Residence Hall, (1962-1963)
Member, Makiling Literary Club
Member, Forestry Leaves Staff Section

ORDINARIO, BUENAVENTURA M.
Dupax, Nueva Vizcaya
*Member*:
Forestry Pensionado Club
Masonic lodge (F.A.M.)



ERNESTO ORDINARIO y BAUTISTA
Natividad, Pangasinan
Bachelor of Science in Forestry
*Member*:
Alpha Phi Omega Int'l Service Fraternity
Forestry Chess Club
Forestry "Y" Club
Vigilance Committee (1963-'64)

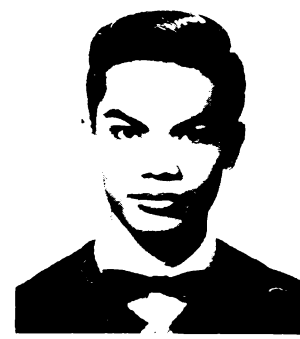
CONRADO P. PADRONES JR.
Pototan, Iloilo
Bachelor of Science in Forestry
Ranger Certificate (1955)
B.F. Personnel Scholar—8 semesters
Auditor—U.P. Forestry Pensionado
P.R.O.—Senior Class Organization, (1963-1964)
*Member*:
Forestry Leaves Staff
Beta Sigma Fraternity
Makiling Literary Club

AGUSTIN PASTOR y DIEGO
Dumaguete City, Negros Oriental
Bachelor of Science in Forestry
Business Manager, Freshman Class Organization
Press Relation Officer, Junior Class Organization
Keeper of the Rolls, Alpha Phi Omega
Treasurer, UPSCA
Representative to the Central Council UPSCA
Vice-President, U.P.C.F. Chess Club
Member Forestry Soccer Team

ANTONIO PRINCIPE y GARRIDO
Bongabon, Nueva Ecija
Bachelor of Science in Forestry
Entrance Scholar, First Semester (1960-61)
Secretary, Sophomore Class Org. (1961-62)
Fellow Charge d' Affaire, Zeta Beta Rho Honor Fraternity (1963-64)
*Member:*
Vigilance Committee (1961-1962)
Forestry Chess Club
Forestry Forensic Club
Forestry Residence Hall Assn.

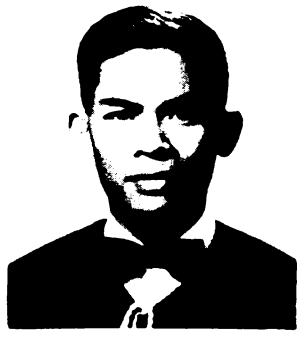
LOPE REYES y DURAN
Masbate, Masbate
Bachelor of Science in Forestry
B.F. Scholar (1st sem. 1961-62)
Assistant Treasurer, University Student Council (1963-64)
Business Manager, UPSCA (1963-64)
Charge d' Affaires Zeta Beta Rho Fraternity (1962-63)
College Councilor, University Student Council (1963-64)
Editor-in-Chief, Forestry Leaves (1964)
Editor, The Zetan (1963)
Herald, Zeta Beta Rho Fraternity (1963-64)

DAVID M. ROJAS
Licuan, Abra
Bachelor of Science in Forestry
B.F. Pensionado (4 semesters)
Ranger Certificate (1953)
*Member:*
U.P. Forestry Pensionado Club
Sgt.-at-Arms—Makiling Literary Club
Beta Sigma Fraternity
Makiling Literary Club



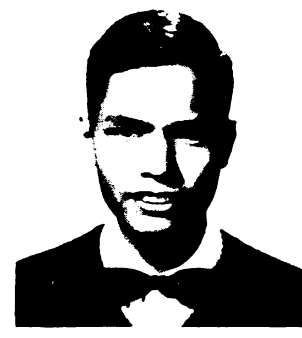
SERNA, ARSENIO B.
Cabugao, Ilocos Sur
*Member:*
UPSCA Forestry Chapter
Forestry Softball Team
Track & Field Team
YMCA

ANASTACIO SISON y BUGASTO
Aguilar, Pangasinan
Bachelor of Science in Forestry
Ranger Certificate (1955)
B. F. Scholar (8 semesters)
President, Makiling Literary Club (1963-64)
Vice-Pres., Makiling Literary Club (1962-63)
Associate Editor, Forestry Leaves
Contributing Editor, Forestry Leaflets
Sgt.-at-Arms, Forestry Res. Hall Assn.
Topnotcher, Forester Exam (1959)



MAXIMO TANDOC y DE VERA
Dagupan City
Bachelor of Science in Forestry
Leadership Award, B.E. Homecoming (1961-1962)
President, Junior Class Organization (1958-1959)
Grand Princep, Beta Sigma Fraternity (1958-1959)
Athletic Manager, FSBO (1958-1959)
Managing Editor, Forestry Leaves. (1963-1964)
Grand Princep, Beta Sigma Frat. (1962-1963)
Member, Forestry Basketball Team

ESTER T. VERGARA
Bachelor of Science in Forestry
Mercedes, Camarines Norte
Bachelor of Science in Forestry
B.F. scholar (6 semesters)
Secretary, Senior Class Organization
Secretary, Junior Class Organization
Treasurer, Sophomore Class Organization
Treasurer, Freshmen Class Organization



CARLOS WANDISAN y LEGMAN
Conner, Apayao, Mountain Prov.
Bachelor of Science in Forestry
Ranger Certificate (1955)
B.F. Pensionado (4 semesters)
Third Degree, K of C Council 4207, Kiangan, Mt. (1959-present)
Second Vice Grand Princep, Beta Sigma Frat. (1963-1964)
Auditor, Baguio-Mt. Prov. Students Assoc. (1962-1963)
Treasurer, Senior Class Organization (1963-1964)
Secretary, U.P.S.C.A., Forestry Chapter (1963-1964)

WONGWILAI PRAYOON
Royal Forest Department
Bangkok, Thailand
Bachelor of Science in Forestry
Member—International Club
Beta Sigma Fraternity

## JUNIORS (not pictured)

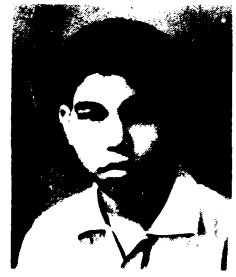
Afalla, Prudencio S.; Agustin, Pedro S.; Banaag, Valeriano S.; Barrozo, Juanita S.; Battung, Benito C.; Bolloso, Arturo J.; Boonnab, Charal; Borja, Dan B.; Calangian, Pablo M.; Canceran, Melquiades D.; Capul, Bienvenido Jr. T.; Clemente, Honesto A.; Constantino, Leovino M.; Dacumos, Bernardo Jr. V.; Dalmacio, Marcelino V.; Daniel, Celerino R.; de Ramos, Sancho G.; dela Peña, Isidro L.; dela Cruz, Reynaldo E.; dela Torre, Venia L.; Desamero, Rodelo S.; Dumelod, Elias G.; Dumlao, Artemio C.; Ecang, Rainer M.; Ellazar, Magdaleno B.; Escalante, Ponciano D.; Estrada, Venancio Jr. L.; Fernandez, Ruben M.; Figarola, Damaso B.; Florido, Levi V.; Galinato, Florencio C.; Gendrano, Brigido A.; Guillermo, Lorenzo J.; Gumayagay, Julian T.; Gumnad, Jose G.; Guzman, Elias S.; Jaca, Rodolfo M.; Jurado, Mariano P.; Kongfisar, Chamthul; Lamanilao, Wilelmo D.; Madamba, Manolo R.; Magno, Vicente C.; Marquez, Ernesto C.; Mercado, Nelson M.; Nisperos, Gregorio O.; Oliveros, Oscar G.; Osbucan, Peter B.; Padre, Elpidio S.; Peria, George V.; Rabanal, Valerio T.; Ragudo, Teodulo J.; Santos, David V.; Seril, Dante A.; Sulit, Mario Jr. Q.; Tamolang, Eufemia B.; Tamolang, Francisco Jr. B.; Tavita, Josefino L.; Tugade, Leonardo S.; Udaundo, Zoilo L.; Valiente, Generoso C.

## SENIORS (not pictured)

Agpaoa, Alfredo C.; Alcomendras, Artemio F.; Castillo, Cenon M.; Clemente, Francisco A.; dela Rosa, Rogelio M.; Ewoc, Cornelio G.; Galo, Crisanto A.; Gatan, Florante M.; Hamada, Oscar M.; Malbog, Salvador B.; Mendoza, Antonio M.; Padre, Dominador G.; Petilos, Gerundio P.; Sumajit, Bonifacio S.

# JUNIORS

AGBISIT, TEOGENES T.
Dugo, Camalaniugan, Cagayan
F.C.O., Rep. to FSBO, 1960-61.
Grand Chancellor, Alpha Phi Omega International Fraternity, 1962-63.
Staff Writer, Forestry Leaves, 1962-63.
Literary Editor, Forestry Leaflets, 1962-63



BERSAMIN, REMUS
Kapatagan, Lanao del Norte
*Member*, UPSCA

GANAPIN, DELFIN G.
Victoria, Tarlac
B.F. Pensionado
Member, Pensionado Club
Junior—1963-1964

MABANAG, FRANCIS S.
Claveria, Cagayan
B.F. Pensionado
President, Junior Class—1963-64
Member, Pensionado Club
Member, Zeta Beta Rho Fraternity
Member, Forestry Leaves Staff

PINTOR, ALFREDO
Dumaguete City
B.F. Pensionado

RABANAL, PABLO
Alaminos, Pangasinan
UPSCA

RENDORIO, FRANCISCO C.
9-B, B. Masilang St.
Piñeda, Pasig, Rizal
*Activities*:
Ranger Class '56
BF Personnel Pensionado
Member, Zeta Beta Rho
PRO, Junior Class Organization

SAMBAJON, HERMINIO B.
Lucena City
FSBO Treasurer, 1963-64
Fellow Bursar, Zeta Beta Rho, 1963-64
Editor, *The Zetan* 1964
Associate Editor—*Forestry Leaves*

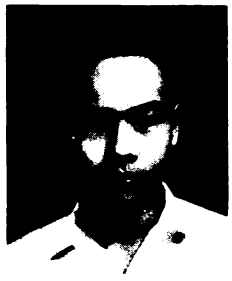
REYES, BARTOLOME R.
Dagupan City
B.F. Pensionado
Member, Pensionado Club
Junior—1963-1964

TANDUG, EUSTAQUITO
Pandan, Antique

THE SENIOR CLASS ORGANIZATION

# SOPHOMORES

ANGEL, ALBERT
Bascaran, Solano
Nueva Vizcaya



CARLOS, ERNIE
Cabanatuan City
UPSCA

CELZO, PELUSIO
Bahi, Garchitorena
Camarines Sur

SORIANO, ANGEL
Paniqui, Tarlac
Zeta Beta Rho
Pensionado Club

VILAR, CRISOSTOMO
College scholar—2 semesters; BF scholar—3 semesters;
Pres., Sophomore Class Orgn.;
Pres., Freshmen Class Orgn. (1962-63);
2nd-Vice Grand Princep Beta Sigma Fraternity;
Forestry Correspondent, Phil. Collegian; Sec., Makiling Literary Club;
PRO, Forensic Club;
Former Staff Member, Forestry Leaflets and Leaves;
Member, Pensionado Club and FSBO Council.

YAO, CALIXTO
Davao City

J. P. Benzon
(*Unit Pres.*)

N. Zabala
(*Adviser*)

T. Binua
(*Chairman*)

UPSCA (Forestry) Inductees
UPSCA Induction Ball
Forestry Chapter, Dec. 18, 1963

# FRESHMEN

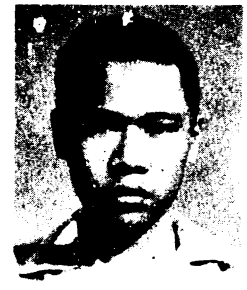
ABAQUIN, ERLANDO
Pinagsanghan, Pagsanjan Laguna

ANCHETA, ODINO
Bangui, Ilocos Norte

ARTECHE, JAIME
Baleno, Masbate

BARTOLOME, CORAZON
College, Laguna

JAIME C. BATOL
2627 T. Earnshaw, Tondo, Manila



BELLEZA, JAIME M.
Unisan, Quezon
*Member*: UPSCA

BUENAFLOR, VICTOR
Surigao, Surigao del Norte

BURGOS, ROLANDO
Butuan City

DE LA CRUZ, MELCHOR
Camiling, Tarlac

DEOGRACIAS, ROSITA
College, Laguna

DIFUNTORUM, JOSE
San Marcelino, Balungao, Pangasinar

HOFILEÑA, ALBERTINO Z.
Davao City
Cadt. Officer, U.P. Los Baños
ROTC Unit

GALEON, ROMEO
Incañgan, Dupax, Nueva Vizcaya

GOMEZ, FLORENTINO
Incañgan, Dupax, Nueva Vizcaya

GUERRERO, JOSE
Buhi, Sn. Miguel, Catanduanes

MACARAEG, LAUREANO E. JR.
Sta. Maria, Pangasinan

MACASAET, ROGELIO
Los Baños, Laguna

MACHACON, MARIANO T.
Sili, Binaloban, Pangasinan
*Member*:
B.F. Scholar
Staff Member—*Forestry Leaves*

MANGOGNAHAN, LOPEZ
Nato, Esperanza, Agusan
Private Scholar (Tirador Lumber Co.)
*Member*: YMCA, Pensionado Club

MEDINA, REOPHI
Butuan City

NARCISO, MINDAJAO
Villa Jacinta, Macrohon
Leyte del Sur

NISPEROS, RIVERACION
Balungao, Pangasinan

PANGILINAN, ELPIDIO
Umingan, Pangasinan

PANTALEON, CESAR
Sta. Fe, San Marcos Liro, Zam.

PARONG, CARLOS
Bayombong, Nueva Vizcaya

PEROCILLO, GEORGE
Butuan, Masbate

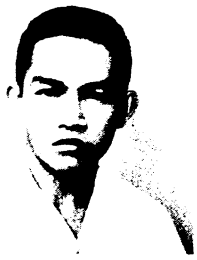
PRINCIPE, EDUARDO
Victoria, Tarlac

QUILLOY, ADELAIDA B.
Los Baños, Laguna

RAMOS, BENIGNO
San Juan, Ilocos Sur

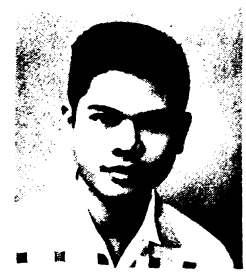
SAAVEDRA, LUTH Q.
Basug, Camarines Norte

SUGUITAN, ARTHUR A.
Vintar, Ilocos Norte

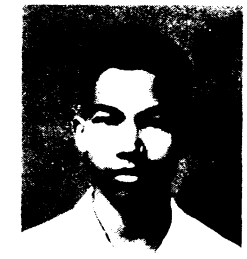


TEXON, GREGORIO
Lagonoy, Camarines Sur

TORRE, MARCELINO
Sto. Domingo, Ilocos Sur



TORRENUEVA, ALLEN
San Miguel, Catanduanes



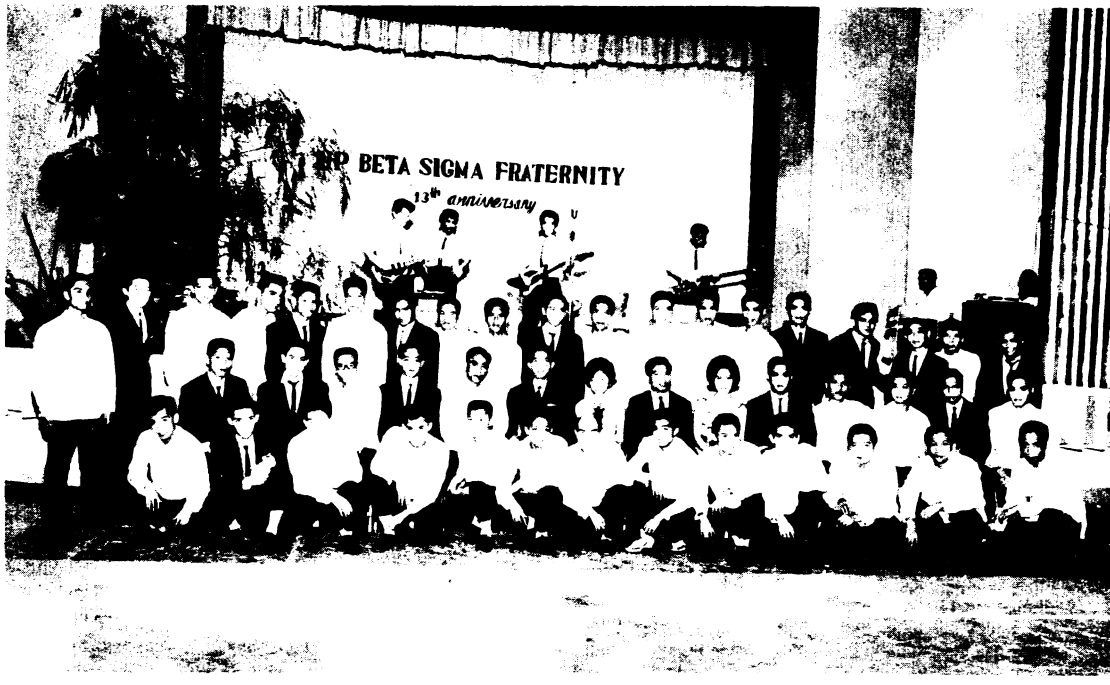
VELASCO, ABRAHAM
Tayug, Pangasinan

VILORIA, MARCOS
Matalao, Faire, Cagayan

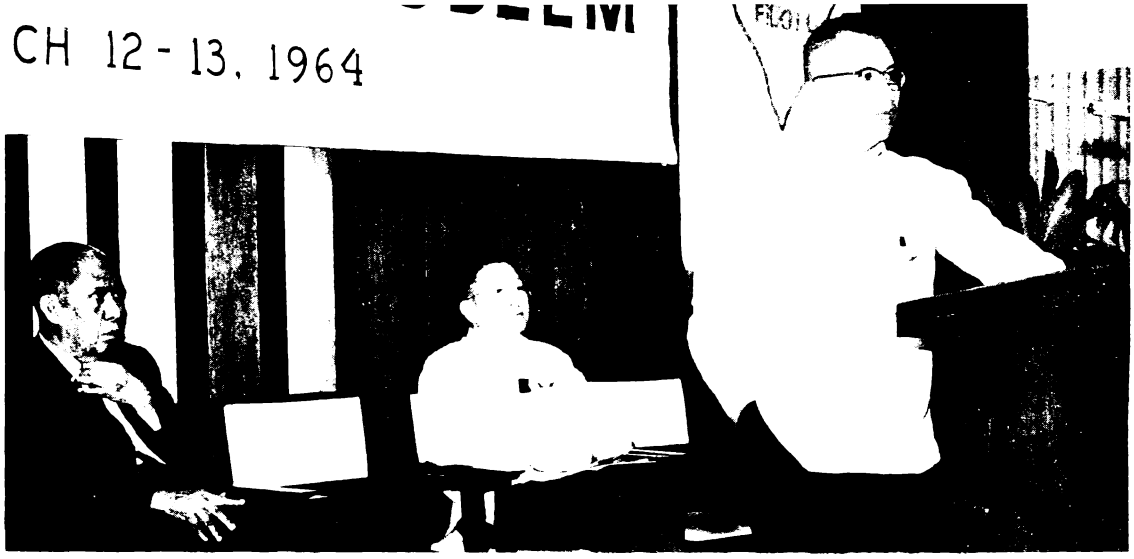
ZAMBRANO, MANUEL
Caloocan City

NOTE: Students of Different classes who failed to submit their pictures on or before deadline are not included in this pictorial section.

Too long captions under pictures of B.F.S. Candidates had to be cut.




U.P. BETA SIGMA BALL, College of Forestry, held at Baker Hall on December 14, 1963 in honor of the new members, incoming and outgoing officers and sweethearts.



*Left to Right: Hon. Cornelio Balmaceda,—Secretary, Department of Commerce and Industry and one of the Resource Speakers; Dean Gregorio Zamuco—U.P. College of Forestry and one of the conference chairmen during the discussion sessions; and Dr. Agaton Pal—Head, Community Development Center, Silliman University and One of the Resource Persons (speaker)*

***Others in the Picture** (sitting, left to right): Mr. Baldomero T. Olivera, Vice President for Public Relations, Philippine Long Distance Telephone, Toastmaster; Director Apolonio F. Rivera, Bureau of Forestry; Regent Florencio Tamesis (partly hidden)—General Manager, Nasipit Lumber Company; Dean Gregorio Zamuco—College of Forestry; Don Jose G. Sanvictores—Chairman of the Board, Aras-asan Timber Company; Senator Manuel P. Manahan—After-dinner speaker.*

DIRECTOR & MRS. HESMER VISIT THE COLLEGE

*Left to right*: Rafael Navallasca—Regional Supervisor, R.A.; Director Hesmer—German Forester; Mrs. Hugo Kraemer; Jose Viado—Administrator, R.A.; Dean Gregorio Zamuco—Chief, For. Mgt. Div., R.A.; Prof. Domingo Jacalne—Associate Prof. & Chairman of For. Education & Information Div.


January 9, 1964

The Chairman and Members
Forest Products Research Board
Manila
Gentlemen:

I have the honor to submit herewith a report covering my official trip to Rome as a member of the Philippine delegation to the 12th FAO Conference held in that city from November 5 to December 6, 1963. This FAO Conference is usually held in November of every other year (biennial session).

The official Philippine delegation consisted of the following:

1. Secretary Jose Y. Feliciano of the Department of Agriculture and Natural Resources —*Chief delegate*
2. Director Eugenio E. Cruz of the Bureau of Plant Industry—*1st alternate*
3. Director Anacleto B. Coronel of the Bureau of Animal Industry—*2nd alternate*
4. Director Manuel R. Monsalud of the Forest Products Research Institute—*Associate*
5. Commissioner Arsenio Roldan, Jr. of the Fisheries Commission—*Associate*
6. Assistant Director Juan Utleg of the Bureau of Forestry—*Associate*
7. Miss Lourdes Garabato, Executive Secretary of the Philippine National FAO Committee—*Associate*
8. Mr. Fernando de los Reyes, Chief, Agricultural Information Division of the Department of Agriculture and Natural Resources—*Secretary of the delegation*

Exhibit A shows the Philippine delegation posing with Director-General B. R. Sen of the FAO Organization when said delegation paid its respects to and congratulated the Director General for his reelection to serve four years more.

Our delegation, on behalf of the Philippine Government, proposed to the Director-General the following which the latter approved:

1. The furnishing by the Republic of the Philippines of one room at the FAO headquarters in Rome to be labelled "Philippine Room," in which our subsequent delegations to FAO could meet in privacy.
2. The holding in Manila, the Philippines being the host, next November of:
   (a) The next meeting of the International Rice Commission and
   (b) The next Regional FAO Conference

Each of the delegates acted as an adviser to the Chief Delegate on matters pertaining to his or her field of specialization. The undersigned was designated to advise the Chief delegate on matters related to forest products utilization, research and wood-using industries in the Philippines.

At the beginning of the conference, there were 104 countries represented. Later on, more countries mostly from Africa, were admitted, making a total of 112 member nations presently comprising the Food and Agriculture Organization.

Generally speaking, there were several kinds of meetings attended, or participated in, by the delegates from the different countries, namely: technical committee, commission and plenary session meetings.

For the first two weeks, technical committee meetings were held. Tne recommendations of the technical committees were subsequently submitted to Commissions 1, 2 and 3, which discussed, amended, or approved the reports of the Technical Committees. Finally, the commission reports were submitted at about the last week of the conference to the Plenary Session, in which only the Chief delegates of all the member countries formally participated. Here, the final resolutions, the FAO budget for the next 2 years, the election of the Director-General, the acceptance of new members, etc., were taken up.

There were several technical committees, i.e., technical committee on forestry and forest products, plant production and protection, nutrition, animal protection and production, atomic energy, freedom-from-hunger campaign, fisheries, agricultural information and education, land and water development, and others.

Exhibit B, herewith attached, is the Philippine country statement prepared by the delegation. It was read at the Plenary Session by the Chief Delegate, the Honorable Jose Y. Feliciano.

One resolution, marked Exhibit C, sponsored by the delegations of Denmark, Finland, Norway, Sweden, Pakistan and the Philippines, is hereby submitted for your information. This concerns the relationship between FAO regular program of work and its field programs.

Exhibit D herewith is the final report of the Technical Committee on Forestry and Forest Products of which the undersigned was a member and he participated actively during its meetings. This report was discussed thoroughly during the Commission deliberations and at the Plenary Session. Finally, it was approved by the Conference.

On his return to the Philippines, the undersigned was granted permission to stop in Israel. He visited the Fibres and Forest Products Research Institute in Jerusalem.

This Institute was built in 1954 and is located in the city of Jerusalem, Israel. At the initial stage, only 10 researchers were employed. In December, 1963, 70 men and women were working in this laboratory.

Their work is divided into two groups, namely, research in fibers and on textiles. They are conducting applied and basic researches. This Institute is serving the private industries of Israel that have something to do with fibers and textiles.

The Fibres and Forest Products Research Institute of Jerusalem is governed by a Board of Directors, consisting of 30 prominent persons representing all the branches of industry, the Bureau of Forestry of Israel, Pulp and Paper, Textiles, Veneer and Plywood and other wood-using industries of that country.

One half of the Institute's budget comes from government support and the other half from private sectors in the form of cooperative fees. The Institute has many research contracts with the industries that are existing in Israel, as well as cooperative jobs with the United States of America under the U.S. Public Act 480.

At present, there are employed in this Institute 33 persons in the academic group, 22 in the technical group, and 15 in the administrative staff, such as stenographers, typists, mechanics, etc.

The Fibres and Forest Products Research Institute started originally with a United Nations grant of $50,000. Later, the Institute received financial aid from the United States of America under the USOM. Nowadays, it is getting very little financial help from either source.

The undersigned has made arrangement for exchange of technical publications between that research institution and the FPRI.

The Israel's Institute is actively working on fibers and textile projects. Some of their projects are classified and, therefore, not published. On the other hand, the non-classified work can be published at the discretion of the Director of the Institute.

Presently, they have 3 tannin development projects in cooperation with the United Nations Special Fund.

They have already some important accomplishments. One is the treatment of wool to make it shrink proof. Prior to this finding, wool, if wet or soaked in water, shrinks very much and, even though dried later on, does not go back to its original form or size. Now wool treated in accordance with the process invented by the Israel's Institute does not shrink at all. This process has already been patented by the Fibres and Forest Products Research Institute. Over there, they have developed and patented three kinds of glue from tannin—hot setting, cold setting and contact glue. Also they have perfected a process of making tannin foam similar to rubber foam.

They have been enjoying some financial aid for research purposes from the United States of America by taking advantage of the US Public Act 480. They have perfected a process to impart to wood, hardboard, and plywood high fire resistance. In the case of hardboard fire-proofing, an estimated additional cost of 30% is involved. This process has also been patented by the Israel's Institute.

I gathered the information that they use bromine for fire-proofing wood. I am also informed that Israel is a supplier of lowcost bromine compounds and that Japan is an importer of potassium salts from Israel. Israel extracts bromine and potassium compounds from the water of the Dead Sea portion of Israel. Japan exports in turn to other countries of the world potassic fertilizers.

It may be mentioned in passing in this connection that potassium is one of the main constituents of commercial or chemical fertilizer and, therefore, to our agriculturist, it should be preferable to import directly from Israel potassic fertilizer inasmuch as this direct importation would bring down the prices of this important material. Bromine is the main constituent, according to my information, in the preparation of chemical solutions used in

wood stabilization as well as in fire-proofing of hardboard and other wood-based panels.

Israel has a big desert called the "Negev". I gathered that there in this desert the main crop being grown is sisal, which is similar to maguey. Fibers are extracted from sisal principally for rope making and for cottonizing purposes. I was informed further that for years they had a problem in connection with the processing of sisal. The extraction of fibers gave rise to tremendous stripping waste which was practically worthless and it posed a serious disposal problem. Scientists in Israel worked on this and found later on that at least two important products can profitably be extracted from the sisal stripping wastes, namely, carnauba wax and pectin. Carnauba wax has many important commercial or industrial uses, such as in the manufacture of floor wax, shoe polish, wax paper sizing, etc. While pectin is principally used in the manufacture of jellies, as well as in supplementing chicken feeds so as to render the yolk of the egg highly colored, attractive, and palatable. In the Fibres and Forest Products Research Institute, they have been experimenting with laying hens fed with the ordinary chicken feed as well as on hens fed with pectin-enriched feeds, the pectin extracted from the sisal stripping waste. The eggs laid by the hens fed on the pectin-enriched feeds are larger and their yolks are more highly colored, attractive and palatable. On the other hand, the hens employed under the controlled, that is, without additional pectin on their diet, produced eggs with pale, unattractive yolk.

Perhaps the waste from abaca, or the filter press cake from the sugar mills in the Philippines, may yield waxes as well as pectin in quantities worth recovering. Research studies, therefore, on these by-products are strongly recommended to be undertaken here in the Philippines.

I took note of the fact that practically all the researchers now in the Fibres and Forest Products Research Institute of Israel formerly worked in many occupied countries of Europe, such as Germany, Austria, Poland, Hungary, France, Czechoslovakia, Yugoslavia, etc. These scientists were driven away from those countries. Many of them are now settled in Israel. Because of their high technical training and the fact that they read and speak several languages, they easily take up ideas and learn a lot faster than most English-speaking scientists. Because of this, they seem to be better researchers or scientists than many research workers in other countries.

Although Israel is relatively a poor country, when it comes to natural resources and climate (it has an average annual rainfall of about 32" and 52 rainy days in the year), it is believed that, because of the industriousness, perseverance, technical know-how and cooperative spirit exhibited by her scientists, Israel has been enabled to develop very fast in science and technology and that it has been producing and exporting many kinds of items, such as textiles, citrus, apples, grapes, leather, chemicals, and many others. Israel has already discovered oil in its territory. Despite its small land area and not big population, Israel has developed very fast in the recent years. It is now considered a developed country.

During the undersigned's visit at the Israel's Institute, he saw small specimens of old clothes and leather recently found in some caves in the desert of Israel and, upon dating with radiosotope C-14, these specimens were found to be more than 5,000 years old, thus showing that the arts of cloth waving and tanning hides were already known to man several thousands of years before Christ.

The undersigned followed up the FAO fellowship awarded to Salvador M. Fanega and the extension of the fellowships of Max Sagrado and Mrs. Phillips with the FAO officers concerned. Max Sagrado's fellowship has been extended for another 5½ months, that is, up to June 15, 1964, to enable him to finish his thesis and obtain M.S. in forestry. The undersigned made strong representations for the extension for another 12 months of the Andre-Mayer fellowship of Mrs. Phillips, who is presently enrolled in Yale University so that she could finish her thesis and at the same time work for her MS. Negotiations are up to now still going on pending receipt by FAO Rome of favorable reports and recommendations from Mrs. Phillips' Major Professor.

Concerning Fanega, the undersigned was able to expedite action on his case and that Fanega already has received an FAO fellowship award for 2 years. Fanega is scheduled to report to Washington, D.C., on or before January 22, 1964. He will work for his doctorate in wood chemistry at the University of Wisconsin.

Regarding our request for financial assistance from the United Nations Special Fund for the establishment of the South East Asia Pulp and Paper Training Center to be established in this locality, the undersigned had a series of informal discussions with the officers in the Forestry and Forest Products Division of FAO. These people are in sympathy with our proposal. They are now fully posted on our request. They gave the undersigned valuable tips just in case the United Nations Assistance Fund Board will consider our re-

quest favorably and will endorse the same to the FAO for field-program implementation.

The undersigned would like to offer some observations in the selection of future members of the Philippine delegation to represent the Forest Products Research Institute in subsequent FAO Conferences. Whoever will be selected by our government to comprise the Philippine delegation, they should be given at least three months' notice so that they can keep themselves posted on all the background papers in order that when they would reach Rome, they could participate well in the technical committees' meetings with competence and confidence instead of their being present at said meeting like novices. This could only be attained by reading background information, or briefing them sufficiently by those, who have already had experience in or attended such FAO meetings in the past.

The undersigned is of the belief, in order that our country could derive great benefits from these FAO biennial meetings, the heads or deputy heads of the following Philippine government agencies should comprise the Philippine delegation:

1. The Secretary, DANR or our Ambassador in Italy—to be the Chief of the Delegation
2. Bureau of Plant Industry
3. Bureau of Animal Industry
4. Forest Products Research Institute
5. Bureau of Forestry
6. Philippine Atomic Energy Commission
7. The Institute of Nutrition
8. The Fisheries Commission
9. The Publication and Information Division of the Department of Agriculture and Natural Resources.

It is realized that this suggestion will involve additional government expenditure. However, the Philippines may be able to receive sizeable financial help from the FAO as well as the services of experts, technical aid in the form of fellowships, and others coming from that world organization of which the Philippines is a *bona-fide* member in good standing. Our country belongs to the underdeveloped or developing group, appropriate to receive help from the FAO provided our requests for such help can be properly presented and fully justified. It cannot be denied that, as a rule, friendly personal contacts with officials of the FAO may generate sympathetic understanding on their part of our problems or requests for technical assistance, etc.

Very truly yours,

MANUEL R. MONSALUD
*Director*

* * *

D-1, Personnel
Soriano, V. P. December 17, 1963
The Director of Forestry
Manila

Sir:

In connection with the observance of Government Employees Week in conjunction with the "Christmas Program" sponsored by the National-Provincial-Municipal offices in Laoag, Ilocos Norte, as initiated by the Honorable Provincial Governor, I have the honor to inform that the name of Forester Victoriano P. Soriano has been submitted to the Chairman on award to receive the Certificate of Merit on December 18, 1963, as the most outstanding employee of the Bureau of Forestry, Forest District No. 1 (Ilocos Norte).

Attached is a copy of the citation.

Very truly yours,

(Sgd.) BERNABE SM. ZUMEL
*District Forester*

* * *

Republic of the Philippines
Department of Agriculture and Natural Resources
BUREAU OF FORESTRY
Office of the District Forester
Laoag, Ilocos Norte

D-1, Personnel
Soriano, V. P. December 17, 1963

MOST OUTSTANDING EMPLOYEE
Bureau of Forestry (Ilocos Norte) for the Year 1963

Forester Victoriano P. Soriano was born in Bangui, Ilocos Norte, on February 22, 1932. As a child he was intelligent as will be shown in his academic achievements in the elementary grades and high school. He came out as Salutatorian in both the intermediate and high schocol. After graduation, he was taken in as a pensionado in the College of Forestry, U.P., obtaining the Ranger Certificate in 1955. Immediately thereafter he was employed in this Bureau and first saw service in Roxas City as a Temporary Ranger until later transferred to this forest district. He is also a holder of Bachelor of Laws degree, and a Ranger Civil Service eligible.

For what he is now is all the result of a meritorious service. He is efficient in his work, loyal to the service, honest, reliable, trustworthy and has shown keen interest in improving himself for better service.

With his educational preparation, experience and eligibility, Forester Sorinao has a bright future in the Bureau. With his background in law, he handles G.L.R.O. and Kaingin cases in court.

In recognition of such excellent qualities and exemplary service, Forester Victoriano P. Soriano has been selected the "MOST OUTSTANDING EMPLOYEE" of the Bureau of Forestry, Forest District No. 1 (Ilocos Norte) for the year 1963.

BERNABE SM. ZUMEL
*District Forester*

* * *

December 27, 1963

The Editor
Forestry Leaves
College of Forestry, U.P.
College, Laguna

Sir:

I am enclosing herewith a copy of a letter, dated October 29, 1963, sent to the Director of Forestry by Mr. Jose G. Sanvictores, Chairman of the Board of Aras-asan Timber Company and concurrently a member of the Forest Products Research Board.

We find this letter interesting and informative and so we asked permission from him that we will submit a copy of it for publication in the Forestry Leaves. Mr. Sanvictores has given us permission to have this letter, or extracts of it, published in the Forestry Leaves.

In this connection, therefore, we request that this letter be published in the Forestry Leaves for the benefit of the students of forestry, researchers, the wood-using industries, etc.

Thank you very much for this and past favors.

Very truly yours,

MANUEL R. MONSALUD
*Director*

Encl.: As stated.

* * *

October 29, 1963

The Director of Forestry
Manila
Dear Mr. Bernal:

I went to Japan on September 2nd and visited national and private forests in Hokkaido and Honshu. On this trip certain features of the practice of forestry in Japan and the operation of their processing mills impressed me deeply and I wish to share my observations with you.

In Hokkaido I visited the mill of the Oji Paper Company, Ltd. in Tomakomai, Hokkaido. This is said to be the third largest paper mill in the world, the largest being located in Canada and the second largest in Canada again or in the United States. However, in 1964 the Oji Paper Company will be the largest in the world as by then it will complete installation of additional machinery.

The Oji Paper Company owns and maintains the Oji Institute of Forestry Improvement at Kuriyama, Hokkaido. In this institute studies and experiments are being made in relation particularly to genetics. They have a small orchard of seed trees on which have been grafted scions from carefully selected trees. And from these seed trees are obtained the seeds for propagation. The scope of the Institute's work embraces—

1. Tree Breeding
2. Silviculture
3. Forest Soils & Fertilizers

At Niwan Mitsui & Company has a forest or tree farm where exotic and native species from Honshu are being tested. They are also carrying on afforestation and reforestation on a commercial scale. In Niwan (and this is true with other forests I have visited) they cultivate forest trees with greater care than we cultivate coconut trees and other trees of economic value. In the Toya National Forest bordering Lake Toya in the mountain of Hokkaido, studies on forest improvement are also being carried on in the nurseries and in the mountains.

As you may recall, vast areas of forest were destroyed in Hokkaido some six years ago. I read about this destruction by typhoon but I did not realize that the damage was anywhere as extensive as I saw it. Whole ranges of mountains were laid bare completely by the strong wind and so these vast areas present an aspect similar to our forests that have been destroyed by kaiñgin farming. I was told that after the typhoon all the trees blown down by the wind were logged and taken to sawmills or pulp mills. It took some three years to clean the destroyed forests and they are now planting these areas with hundreds of thousands of forest seedlings. The work is being carried on a tremendous scale. One has to see it to get a true idea of the immensity of the work involved.

I visited a plywood and sawmill and the way this mill utilizes every part of the log is just amazing to one accustomed to see so much waste in our logging camps and in our mills. Actually

there is no waste left on the ground. Everything is utilized. Pieces as short as 14" are T & G'd on the sides and both ends and spliced as floor lumber. Narrow strips are glued together and overlaid with veneer for export to the United States for cabinet work. Log centers are sawn into boards mounted on small carriage pushed and pulled by men. Boards that would be thrown or burned as waste in our mills are planed and glued together to make laminated lumber after tediously removing the knotted portions and replacing them with strips of wood. The high utilization of wood products seen in all sawmills and plywood factories visited results in elimination of waste.

From Hokkaido I went back to Tokyo and visited the Akazawa National Forest. Although this is a forest located in high mountains, the means of transportation used is railway. The logging operation is carried on in such a way that even at the spar trees there are no wastes to be seen. Poles as small as 4" in diameter are brought down and sawn into small pieces for moulding. Along with logging, extensive reforestation work is being carried out. Steep mountain sides are planted to trees way up to the top. No vacant spaces is allowed unplanted. Power tools are used for brushing and digging holes. The operations are highly mechanized and production per man is very high indeed.

Temperate forest trees are slow growing and take some 65 years or more before they reach maturity and even at that age the diameter of the log cut is much smaller than our lauan trees. Hinoki is one of these species and takes some 65 years before it can be sawn into lumber. Saplings 10 years old would be the equivalent of saplings 2 years or younger in the Philippines. But this does not deter the Japanese foresters from planting Hinoki in their logged over areas or other species on denuded lands and so their forests are maintained in a highly productive state.

In the mountains called the Japanese Alps, there is a National Park that is visited by hundred of thousands of people during the summer. This is in Kamikochi No logging is being done here but the forests are maintained as a national park and cared for at great expense.

At the government forest experiment station at Meguro, Tokyo, I learned that this experiment station, contrary to my previous impression, is not just a forest products station. It is carrying on work in silviculture, forestry improvement, genetics, soil erosion and, of course, forest products experiments and researches. Unlike our Forest Products Research Institute whose activities are limited to wood processing and related studies, the Meguro station carries on experiments and studies in all phases of forestry. In other words, the Meguro station is the Forest Products Research Institute, the Bureau of Forestry, the Reforestation Administration and Parks and wildlife Commission.

The way they determine the timber stand impressed me most deeply. They have an apparatus at Meguro which can valuate the timber content of a given area from an aerial photograph in much the same way that a cardiograph registers the heart beats. It seems to me that it is an apparatus that registers the light and shadow of a given photograph and there is a system of interpretation of the curves made by this apparatus that enables one to determine the timber content of a given area. They informed me that the margin of error is within 10%. I asked some members of the staff of the Forest Products Research Institute, the College of Forestry, and the Bureau of Forestry about this apparatus and none of them could tell me about it and in fact none of them had heard of it. Since timber valuation is essential to the determination of what should be the allowable cut in any forest, the use of this apparatus will be helpful in the expeditious determination of what timber cut allowance should be given our concessionaires. This apparatus is called microphotodensimeter.

The general impression I carried home with me is Japanese foresters are ahead in the practical application of the principles of forestry and I feel that our foresters can profit by a study of the Japanese methods. When it comes to logging and milling operations, their utilization efficiency is much higher.

On this trip I also took up with our Japanese buyers the question of maintaining our forests in permanent productivity. When Mr. S. Ohtani, Deputy Manager of the Forestry Department of Mitsui & Co., Ltd., came to the Philippines last March 21, 1963 he talked to me of the desire of Mitsui & Co., Ltd. and of Gingu Trading Co., Ltd., who are the buyers of our logs, to help Aras-asan Timber Company in our work of conserving and maintaining our forests in Aras-asan in permanent productivity. As a result of that conservation, we entered into a definite arrangement for the establishment and maintenance of a small experimental forest in Aras-asan to be known as the AGM forest. A standing for Aras-asan Timber Company, Inc. G for Gingu Trading Co., Ltd. and M for Mitsui & Co., Ltd. There is now at Aras-asan one of the young foresters of Mitsui & Co., Ltd. named Mr. Y. Kobayashi. He is here on a 3-month stay and after him another forester will come and every 3 months or so another will be coming to carry on with the work. It is too early to speak of what we can ex-

pect from this cooperative forest but since it will be managed in close cooperation with the management of the Bureau of Forestry experimental forest in Aras-asan, I am optimistic that this will be of great help to us all.

At this juncture, I wish to state that I submitted the "Preliminary Guide for Timber Stand Improvement of Dipterocarp Secondary Forest" prepared by your Messrs. Reyes and Tagudar for the management of the experimental forest in Aras-asan to Messrs. B. Senda and S. Ohtani both of whom are experienced Japanese foresters. Mr. Senda, particularly, has had wide experience in tropical forestry in the Philippines, in French Indochina (Vietnam), Borneo, Cambodia and other places and in temperate countries like Hokkaido, Honshu and Sakhalin, now part of Soviet Russia. He is well known among foresters and is regarded as an authority on scientific and practical forestry. Mr. Senda had the work of Messrs. Reyes and Tagudar translated into Japanese and he studied it paragraph by paragraph. He told me that he endorsed fully everything said by Messrs. Reyes and Tagudar. I want to tell you that these words of Mr. Senda made me proud of our Filipino foresters.

Sincerely yours,

JOSE G. SANVICTORES
*Chairman of the Board*

* * *

University of the Philippines
COLLEGE OF FORESTRY
College, Laguna
OFFICE OF THE DEAN

February 14, 1964

MEMORANDUM

TO Prof. Jose B. Blando, Adviser, *Forestry Leaves*

SUBJECT: *Forestry Leaves*

I am enclosing herewith a copy of a letter dated February 12, 1964 from the Chairman of the Philippine National FAO Committee, DANR Bldg., Diliman, Quezon City, which is self-explanatory.

If the missing numbers of the *Forestry Leaves* as may be deduced from the enclosed letter are available, it will be greatly appreciated if the same could be furnished this Office in order that they could be delivered to the Office of the Philippine National FAO Committee at the first opportunity.

It is a pleasure to note that the *Forestry Leaves* is missed by other libraries. Its staff should feel proud of this recognition as I am.

GREGORIO ZAMUCO
*Dean*

* * *

February 26, 1964

Dean Dioscoro L. Umali
Vice-President for Agricultural and Forestry Affairs
University of the Philippines
College, Laguna

Dear Dean Umali:

We are taking this liberty of furnishing you herewith a verifax copy of a news item that appeared on page 1 of the supplement of the Manila Chronicle, February 25, 1964 issue.

It appears that there is a tendency on the part of the so-called "forestry extension specialists" to read or gather information or data from the publications or research studies of the Forest Products Research Institute, University of the Philippines, and later on issue press releases or send articles for publication in the cosmopolitan papers without, however, giving credit where credit is due.

In this article, attached hereto, nowhere is mentioned the Forest Products Research Institute, although, as almost everybody has known, it is the only research agency in the Philippines doing very active work, for the last seven years or so, in the pulping and papermaking studies of various local cellulosic raw materials, including agricultural fibrous wastes such as sugar cane bagasse, tobacco stalks, rice straw, coconut leaves and husk, abaca and ramie wastes, banana stalks, etc.

I don't think that heretofore the College of Forestry, University of the Philippines, has done actual experimental studies on the above mentioned materials for the production of pulp and paper. Whoever sent this article for publication in the Manila Chronicle has, we believe, secured the information from the many articles that are now and then issued by the Forest Products Research Institute such as those appearing in the Lumber-

man, Forestry Leaves, FPRI's Technical and Industrial Notes, and others.

Is it being fair or ethical, Mr. Vice-President, for some people from a sister institution not to give credit where credit is due?

We hope that your office could do something to remedy the situation; otherwise, misunderstanding or ill feeling may result between the so-called "forestry extension specialists" and the researchers of this Institute.

*Very truly yours,*

MANUEL R. MONSALUD
*Director*

* * *

REPUBLIC OF THE PHILIPPINES
University of the Philippines
FOREST PRODUCTS RESEARCH INSTITUTE
College, Laguna

March 11, 1964

The Editor
Forestry Leaves
College of Forestry, U.P.
College, Laguna

S i r :

During my official trips in the U.S., Europe, and Australia, I came across copies of the Forestry Leaves in the laboratories of some research institutions that I visited over there. I could not help but be elated to know that this worthwhile magazine dealing mostly with forestry matters and researches, published by the Student Body Organization of the U.P. College of Forestry, is reaching many nooks and corners of the world. Even the great Forest Products Laboratory in Madison, Wisconsin, U.S.A., regularly receives, to my knowledge, copies of your *Forestry Leaves*, which is read by many scientific workers of that research agency.

Even here in our country, there were numerous occasions in the past when the *Forestry Leaves* was greatly sought because of several valuable technical articles appearing in it which many interested people, particularly those engaged in some forest-products-using industries such as charcoal making, pulp and paper manufacture, plywood manufacture, etc., wanted to read or refer to.

Many technical articles written by the researchers of the Forest Products Research Institute appeared already in your quarterly publication and, if we failed to order reprints for free distribution, we were obliged to inform the inquirers that, if they wanted to get hold of copies of our technical articles, to buy some back issues of the *Forestry Leaves* in which such articles appeared and, to our knowledge, many interested parties did follow our advice.

The *Forestry Leaves* is widely read by local entrepreneurs before venturing into some wood-using enterprises. It will be a pity if the *Forestry Leaves*, which is now an institution by itself, will, in the near future, be abandoned or its publication will be stopped.

I heard praises of the *Forestry Leaves* in foreign countries by scientific workers, who had read some issues of it and I think that those praises were merited by your quarterly journal.

I, therefore, express the hope that the publication of the *Forestry Leaves* shall continue indefinitely for the good of the Student Body Organization, College of Forestry, University of the Philippines, and our beloved Philippines. It is indeed an interesting reading material.

*Long Live the Forestry Leaves!*

Very truly yours,

MANUEL R. MONSALUD
Director

(*Continued on page* 148)

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## FORESTRY IN THE . . .

(*Continued from page* 88)

Rivera also said he had taken steps to avoid the loss and misplacement of records which was a serious problem in the bureau in the past. He instructed his staff to number consecutively all documents and accompanying papers and to attach to the folders an index-inventory guide showing a brief statement of the nature of the case and the action taken.

Meanwhile, Amador J. Evangelista, bureau information chief, said a massive information drive in coordination with other forest agencies is being programmed for the approval of Director Rivera. Evangelista said the drive would take into consideration Rivera's main theme of accelerating action on forest protection and conservation which should be anchored on active public cooperation.

(*Manila Times*—Feb. 16, 1964)

* * *

Republic of the Philippines

Department of Agriculture and Natural Resources

BUREAU OF FORESTRY

OFFICE OF THE REGIONAL FORESTRY DIRECTOR

Region No. 7, Zamboanga City
R-7, Administration

Supervision January 24, 1964

The Director of Forestry
M a n i l a

S i r :

In compliance with your verbal order during our recent conference in Manila with the other Regional Forestry Directors to submit not later than January 31, 1964, a comprehensive report of forest conditions of our respective regions:

I have the honor to submit the following report covering Region No. 7, comprising Forest Districts Nos. 36 (Oroquieta, Occ. Misamis), 37 (Iligan City), 42 (Dipolog, Zamboanga del Norte), 43 Zamboanga City), 44 (Basilan City), and 48 (Marawi City), regarding administration, jurisdiction, forest areas, forest protection and occupancy thereof, by Forest District.

1. *Forest District No. 36, Oroquieta, Occidental Misamis*:

This district covers the whole province of Occidental Misamis including the City of Ozamis. Formerly the District Office was located at Ozamis City but had to be transferred when Ozamis became a City.

The affairs of this district is administered by the following field personnel:

a. *District Headquarters*:

Lucilo Torea ..... *District Forester*
Loreto G. Moroña ... *Asst. District Forester*
Trifon M. Halasan ..... *Forester, TMA*
Crispin Getubig ..... *Scaler*
Mariano Paden ..... *Forest Guard*
Nicolas Cagas ..... " "
Emilio Limpahan ..... " "
Cresencio J. Bomediano ..... *Clerk—I*
Bueno B. Mehoy ..... *Driver*
Romulo Doria ..... *EEA Scaler*
Mamodaca Monadi ..... " "
Carlos delos Santos ..... " "

b. *Forest Station—Ozamis City*

Herminigildo Orilloza ..... *Forester, OCS*
Ernesto Hermosura ..... *Forest Guard*
Prudencio Revelo ..... " "
Teopisto T. Jumalon ..... " "

c. *Forest Station—Lalud, Tudela, Occ. Misamis*:

Adam S. Ausan .. *Forest Guard, OCS (Actg.)*
Ramon H. Co ..... *Forest Guard*

d. *Forest Station—Calamba, Occ. Misamis*:

Felipe Gloria ..... *For. Sta. Warden, OCS* (Actg.)
Benedicto Lorejo ..... *Forest Guard*
Lucas Orilloza ..... " "

| No. of Licenses | L i c e n s e e | Location | Area in Has. |
|---|---|---|---|
| 277-63 | Purificacion F. Villarin | Oroquieta | 7,300.00 |
| 916-63 | Vicente Madrio | Oroquieta & Jimenez | 4,300.00 |
| 161-63 | Jaunito C. Tiu | Aloran & Jimenez | 99.00 |
| 720-63 | Juanito C. Tiu | Oroquietaa | 120.00 |
| 1222-64 | Juanito C. Tiu | Tudela & Sinacaban | 426.00 |
| 1321-63 | Pedro Sanchez | Aloran | 54.00 |
| 144-63 | Maximo Lobitaña | Ozamis City & Tangub | 465.00 |
| 117-64 | Andres Rebutazo | Tanñgub | 500.00 |
| 1176-63 | Joaquin Chu | Bonifacio | 972.00 |
| 886-64 | Claudio Oliva | Bonifacio | 992.00 |
| 885-64 | Vicente Oligario | Tudela & Clarin | 860.00 |
| 1411-63 | Luga & Sons, Inc. | Oroquieta | 19,400.00 |
| 1023-64 | Valeriano Estañero | Bonifacio & Aurora | 250.00 |
| 1445-63 | Librada C. Medija | Concepcion & Rizal | Dipolog |

The number of cases of illegal kaiñgins detected, investigated and filed in courts during the fiscal year 1962-63, are as follows:

Area cleared— 27.86 Has.
Cases heard & convicted—3
Pending trial—8 (Remanded to CFI)

*Land Classification Party*:

Daniel Evangelista .... *Forester, Incharge of Party Member (Actg.)*
Cesario Boligor ..... *Forester, Member*
Carmelito G. Sagrado ..... *EEA Surveyor*
Norberto B. Iyog ..... " "
Pedro Evangelista ..... *EEA Computer*
Edgardo Tumlos " "

The remaining forested areas of the province of aproximately 35,738.00 hecatres are covered by fourteen (14) timber licenses, as follows:

The following are the duly registered lumber dealers within the province of Occidental Misamis: No. of cases filed in Court—11;

| *Lumber Dealers* | *Cert. of Registration* | *Place of Business* |
|---|---|---|
| Isaac C. Jabiness | 563—'63 | Oroquieta & Clarin |
| Pershing Tan Queto | 916—'63 | Ozamis City |
| Juan Suarez Yap | 1078—'62 | Plaridel |
| Gonzalo G. Rosauro | 1127—'62 | Ozamis City |
| Juanito C. Tiu | 1077—'62 | Oroquieta |
| Cipriano Balat | 1080—'62 | Jimenez |
| Dy Hai | 1136—'62 | Oroquieta |
| Severo Rollorate | 874—'61 | Calamba |
| Francisco O. Tan | 518—'60 | Ozamis City |
| Dominado Pombuena | 872—'60 | Ozamis City |
| Simplicio Lihat | 516—'69 | Jimenez |
| Benjamin T. Lim | 905—'59 | Ozamis City |
| Potenciano D. Cebedo | 624—'59 | Ozamis City |
| Raynero Ducor | 915—'59 | Jimenez |
| Teofilo Canastra | 745—'59 | Ozamis City |
| Sixto Alensub | 604—'59 | Aloran |
| Frisco Trinidad | 629—'59 | Baliañgao |
| | Oroquieta & Clarin | Oroquieta |

There are also 48 ordinary minor product licenses issued within the province for the gathering and removal from the public forest of the following minor products;

5 licenses for Diliman
9 " " Firewood (mangrove species)
20 " " Split Rattan
4 " " Almaciga resin
6 " " Charcoal making (mangrove & upland species)
3 " " Hagnaya
1 " " Nipa shingles

Aside from the all consuming work on the activities of timber and minor product licenses, applications under special uses and petitions for the release of forest land into alienable and disposable block the different offices, as follows:

Nb. A.—61 received of which 9 were inspected and reported, leaving 52 application pending inspection.

Fp. A.—29 received of which 7 were inspected and reported, leaving 22 applications pending inspection.

Rs. A.—5 applications were received; all pending inspection and report.

Ps. A.—10 applications are received all pending inspection and report.

There are 53 petitions received requesting for the release of forest land, of which 9 were duly acted and reported, leaving 44 cases pending action.

There are 99 nipa-bacawan permits, 1 miscellaneous and 47 residence already issued and subsisting to date. However, the present status of these special use permits have not as yet been checked due to the utter lack of personnel. This is a very good source of revenue for the Bureau of Forestry and, as such these special use permits will soon be individually inspected, including uninspected ones, either already applied or not, so that the corresponding annual rentals can be collected.

2. *Forest District No. 37, Iligan City*:

This forest district takes care of the whole province of Lanao del Norte. It is this same district that took care of the whole Lanao province before it was divided into "Norte" and "Sur".

The forest activities within this district is administered and supervised at its Headquarters located in Iligan City, thru its various field offices and fieldmen as follows:

a. *District Headquarters*:

(District Forester Office had been vacant for the year 1962-63. However, sometime on December 16, 1963, Travel Order had been issued to Forester Mario San Luis to take over the job thereat but up to this writing he has not yet reported. Meantime, Forester Constante Bersamin, is in an acting capacity as its District Forester)

Constante Bersamin .. *Asst. District Forester*
Meliton T. Battad ... *Sr. Forester, TMA*
Miguel Pacas ..... *Forester*
Elpidio Aspiras ..... *Forester, TMO, Iligan City*
Pablo M. Telan ..... *Scaler & Lumber Inspector*
Raymundo S. Tingson ..... *Scaler*
Enrique O. Setiola .... *Clerk—I and SDO*
Rustico Mutia ..... *Forest Guard*
Espiritu Laplap ..... " "
Cosain Macarimbang ..... " "
Frank B. Pamplona ..... " "
Eustaquio M. Ravacio ..... " "
Conrado Salvador .... *EEA Lumber Grader*
Arthuro Lucero ..... *EEA Lumber Grader*
Edison Lachica ..... *EEA Scaler*
Sulog Cale ..... " "
Luis Tingson ..... " "
Rosalio Homecillo ..... *EEA Forest Guard*
Arnolfo Dacua ..... " " "
Alfredo Dondoyano ..... " " "
Ismael Cosain ..... " " "
Japar Usman ..... " " "
Rosita Maslog ..... *EEA Clerical Aide (Separated)*
Brigida Saveses ..... *EEA Clerical Aide (Separeted)*
Asuncion Gayanelo ..... *EEA Clerical Aide (Separated)*
Teodosio Arellano ..... *EEA Forest Guard*

b. *Forest Station, Kulambugan, Lanao del Norte*:
Sabaino D. Roxas .... *Scaler, OCS (Acting)*
Primo Romarate ..... *Scaler*
Rafael T. Ladion ..... *Scaler*
Genaranpande Dimaporo ..... *Forest Guard*
Honorato Llanos ..... " "
Lope E. Fuentes ..... " "
Isabelo Hermocilla ..... *EEA Forest Guard*
Carmelito Guevarra ..... " " "
Berjamin Arquillano ... " " "
Ricardo Romero ..... " " "

c. *Forest Station, Kapatagan, Lanao del Norte*·
Elpidio B. Amolar .... *Scaler, OCS (Actin)*
Meliton Pacas ..... *Forest Guard*
Loreto Ongcoy ..... " "
Anacleto Toledo ..... *EEA Scaler*
Filemon Fernandez ..... *EEA Forest Guard*
Rafael Caña ..... " " "

Since the old province was divided, only ten (10) timber licenses remained within Lanao del Norte, as follows:

| *Timber Licensees* | *No. of License* | *Allowable Cut* | *Address* |
|---|---|---|---|
| Findaly Miller TBR. Co. | LA—13-B | 150,000 M/3 | Kolambugan |
| Misamis Lumber Corp. | O.T. 918—'63 | 13,630 " | Ozamis City |
| Iligan Lumber Co., Inc. | 41—'64 | 24,500 " | Iligan City |
| Kiwalan Lumber Co., Inc. | 114—'63 | 23,000 " | Camague City |
| Misamis Mahogany Co., Inc. | 718—'64 | 25,900 " | Tibaga City |
| David L. Ghent | 864—'63 | 30,000 " | Tominobo City |
| Karomatan Timber Corp. | 595—'63 | 3,500 " | Karomatan City |
| Giant Tbr. & Inc. Corp. | 981—'64 | 3,100 " | Camague City |
| Maria Cristina Tbr. Inc. | 685—'64 | 6,500 " | Iligan City |
| Simeon Canubida | 65—'62 | 2,000 " | Iligan City |

There are 13 Minor Product Licenses, 2 for firewood (Mangrove species), 1 Almaciga resin, 8 Nipa shingles, and 2 split and unsplit rattan.

| Kinds of Appl. | No. of Cases Pending | No. of Cases w/ Permits | Area in Has. | Remarks |
|---|---|---|---|---|
| Residence | 48 | None | 128.40 | Needs yearly inspection per FMO |
| Tree Far Lease | None | 68 | 245.74 | |
| Private Camp | 1 | None | 2.60 | No. 248 to get actual condition of leases. |
| Miscellaneous | 5 | None | 30.00 | |

There are 4 active sawmills within the province as follows:

Findlay Millar Timber Co., Inc.—Kolambugan, Lanao Norte

Kiwalan Lumber Co., Inc.—Camague, Iligan City

Iligan Lumber Co., Inc.—Larapan, Iligan City

Misamis Mahagony Co., Inc.—Tuod, Oriental Misamis

This being a Mos'em province, forest officers are stymied by the unfriend'y and often times very arrogant and defying atittude of most of them, especially on the destruction and occupancy of forest land stemming from their wrong belief that the forest belongs to their forefathers. So much so that while illegal kaiñgin is certainly going on inside the forest, forest officers are quite impotent to enforce kaiñgin law, unless and only with the sustained cooperation and constant protection of the Philippine Constabulary, as well as the enlightened elements of the Moslem population. However, even with these traditional handicaps and hardship brought to bear by the Moslems, during the fiscal year 1962-63, there were detected and investigated 19 cases of illegal kaiñgins, with an aggregate area of about 34.90 hectares, which were subsequently filed in Court. All these 19 cases of illegal kaiñgins are still pending hearing in Justice of the Peace Courts where they were filed.

Also, there are 2 cases pending for Private Woodland Registration covering an area of about 35.46 hectares; one Ordinary Minor Product for Unsplit rattan; one for firewood (Mangrove species); and one for Lumbang nuts.

Likewise there are 27 cases of petitions received, but up to date remain unacted, requesting for the release of forest land for agricultural purposes. These cases remain unacted not only because there are no personnel available to investigate them but also because of the present plan to have these cases referred to any EEA Survey Team who are to undertake the establishment of the "permanent forest one line" within the province. Such Survey Team, however, has not yet been assigned to Lanao del Norte.

Within the province there are 22 lumber dealers who take care of the lumber need of the people. All are duly registered by the Manila Office. There is also one (1) Log Dealer duly registered and is operating in Iligan City. There are no logging contractors operating any timber license within the province.

The Findlay Millar Timber Company, Inc. operates the only Plywood plant within the province. It has an average capacity of 600 plys per day. A, B, & C grades are being exported, while D grades are sold in local markets. There are no known box factory establishment within the province. Logging and sawmiling wastes are, therefore, not being utilized except for firewood.

3. *Forest District No. 42, Dipolog, Zamboanga del Norte*:

This forest district is comprised within the whole territorial jurisdiction of Zamboanga del Norte province. The district headquarters is located at the Capital of province in Dipolog, Zamboanga del Norte.

The forestry activities within this province is administered and supervised by the district Forester thru his several fied offices and fieldmen distributed at strategic locations within the length and breadth of the province, as shown in the attached "list" of personnel and stations, marked as appendix "A" of this report.

The forester in charge, Forester Francisco Abijay, has just retired on December, 1963, so that the incumbent Asst. District Forester Daniel Vadil was duly designated by Manila as "Acting District Forester" thereat meanwhile that another District

Forester is duly designated. As of this writing, no District Forester is in Dipolog, Zamboanga del Norte. However, according to reliable information, Forester Santiago Morao is being designated as District Forester.

The forested areas of the province has been parceled to different timber licenses who are quiet active in logging business, as follows:

| *Name of Licensee* | *Address* | *Location* | *Remarks* |
|---|---|---|---|
| Mandaluyong, Rizal | Zamboanga City | Sibuco, Z. N. | Renewed |
| Añguñgan Lumber Co. | " " | Sibuco & Z. C. | " |
| Aranetaa Tbr. & Dev. Co. | " " | Siocon, Z. N. | " |
| Jose L. Araneta | " " | Siocon, Z. N. | |
| Ass. Invest. Co., Inc. | Dipolog, Z. N. | Siocon, Z. N. | " |
| Agustin Adriatico | 2660 Domingo St. | Dipolog, Z. N. | " |
| Monaliza Lopez Borja | Malate, Manila | Labason, Liloy, | |
| Feliz Cavan | Dipolog, Z. N. | Dapitan City | " |
| Coronado Tbr. Corp. | Dipolog, Z. N. | Dipolog-Katipunan | |
| Ireneo Cabilin | Katipunan, Z. N. | Katipunan, Z. N. | " |
| Epimaco Drilon | Mutia, Z. N. | Mutia, Z. N. | Cancelled |
| Edilberto Necessario | 382 Shaw Blvd. | Labason, Z. N. | Mangrove swamp |
| Filoteo Duhaylungsod | Mandaluyong, Rizal | Polanco, Z. N. | Renewed |
| Pedro Conducta | Dipolog, Z. N. | | " |
| Isaac Jabines & Co. | 1154 Pasong Tamo, | Labason, Z. N. | " |
| Labason Tbr. Enter. | Makati, Rizal | | " |
| Alfonso Lim | Dipolog, Z. N. | Piñan, Z. N. | " |
| Mind. Estates Co. | Manila Hotel | Sindañgan, Z. N. | |
| Henry L. Poole | Zamboanga City | Sibuco, Z. N. | New |
| Paniran Logging Ass. | " " | Sibuco & Siocon | Renewed |
| Johnston Lbr. Co., Inc. | " " | Siocon, Z. N. | " |
| F. Logan Johnston | " " | Siocon, Z. N. | " |
| Francisco Lopez | R-208 Chaco Bldg. Manila | Labason, Z. N. | " Pending renewal |

| *Name of Licensees* | *Address* | *Location* | *Remarks* |
|---|---|---|---|
| Rodolfo Gallepsoso | Dapitan City | Siocon, Z. N. | Pending renewal |
| Misamis Lbr. Corp. | Rm-604, Don Santiago Bldg., Taft Ave., Manila | Piñan, Z. N. | Renewed |
| New Pacific Tbr. & Sup. | | Siocon, Z. N. | Renewed Pending renewal |
| Poblete Const. Co. | Zamboanga City | Labason, Z. N. | Pending renewal |
| Timberman Corporation | 7 Buendia St., Makati, Rizal | Lilog-Salog-Sindañgan Z. N. | Renewed Pending renewal |
| Vic Lumber Co., Inc. | 19 Sto. Cristo, St., | | " " |
| Aguilino Roa Yu | Binondo, Manila | Piñan, Z. N. | " " |
| Gabriela Wlastron Ent. | R-307, Wilson Lbr. | Sindañgan, Manukan, Z. N. | Not renewed |
| Iñgiego Dalman | J. Luna, Manila | | " " |

Besides timber licenses, there are also licenses issued for minor products. There are 3 such licenses for "nipa shingles", 3 for "almaciga resin"; 4 for "firewood" (mangrove species; 17 for "split rattan"; 3 for "diliman"; and 1 for "hingiw" and 1 for "unsplit rattan", making a total of 32 minor product licenses, as compared to 46 in previous years. The 24 minor product licenses were not in operation and, as such, the same were no longer renewed this year.

During the fiscal year, there are only 4 duly registered Lumber Dealers, as compared to 16 in previous years, since 12 of them closed retailing lumber this fear which necessitated their non-renewal.

The following are the active "sawmill operators" within the province of Zamboanga del Norte:

| *Sawmill Permitee* | *Address* | *Kind of Mill* | *Location* |
|---|---|---|---|
| Timberman Corporation | Rm-510 Rosario Bldg.. Manila | Circular | Labason (dismantled) |
| Misamis Lumber Corp. | 604 Don Santiago Bldg., Manila | Circular | Siraway, Siocon |
| Filomeno Libres | Liloy Z.N. | Circular w/topsaw | Tampilisan, Liloy |
| Paniran Sawmill Co. | Zamboanga City | Circular | Sibuco, Z.N. |
| Poblete Construction | 11 Buendia St., Makati, Rizal | Circular | Port Sta. Maria, Siocon |
| Nicolas Bandico | Liloy, Z.N. | Circular | Baybay, Liloy |
| Anatalio Refugio | Liloy, Z.N. | " | Baybay, Liloy |
| Jose Quimbo | Labason, Z.N. | " | Usokan, Labason |
| Coronado Timber Corp. | Dapitan City | Circular w/topsaw | Closed (canceled) |
| Feliciano Buctuanon | Labason, Z.N. | Circular | " " |
| Maria Mora | Labason, Z.N. | Circular | " " |
| Isaac Jabines & Co. | Dipolog, Z.N. | Band | Not renewed |

4. *District No. 43, Zamboanga City*

This forest district is the biggest, as to territorial jurisdiction, among the six forest districts within Region No. 7. It overseers the forestry activities within the whole of Zamboanga del Sur province, the Sulu archipelago, and the City of Zamboanga. It has an aggregate land area of about 1,285,399.89 hectares of "forest land" and "alienable & disposable land", distributed as follows:

a. *Zamboanga del Sur*:

| | | | |
|---|---|---|---|
| Timberland | 274,611.49 Has. | | |
| Unclassified forest | 194,702.39 " | | |
| Alien. & Disposable | 341,946.02 " | — 811,259.90 | Has. |

b. *Sulu Archipelago*:

| | | | |
|---|---|---|---|
| Timberland | 31,426.28 Has. | | |
| Unclassified | 119,922.22 " | | |
| Alien. & Disposable | 124,231.40 " | — 281,640.00 | Has. |

c. *Zamboanga City*:

| | | | |
|---|---|---|---|
| Timberland | 78,816.20 Has. | | |
| Unclassified | 6,051.32 " | | |
| Alien & Disposable | 65,632.47 " | — 142,499.99 | Has. |
| Grand Total | | 1,235,399.89 | Has. |

These vast area, including all phases of forestry activities are administered by the district forester at Zamboanga City thru its various field offices and field personnel which are distributed strategically throughout the length and breadth of its territorial jurisdiction. The attached "list" of personnel and field offices, marked as Appendix "B", shows the men and forest station under this forest district. The incumbent District Forester, Mario San Luis, has recently been ordered to return to Iligan City, his former station, to take over the job as District Forester. Senior Forester Librado Sontillano, has likewise been ordered and designated as District Forester for Zamboanga City. As of this writing, however, Forester San Luis has not as yet reported to Iligan City, while Forester Sontillano is already here in Zamboanga City waiting for Forester San Luis to vacate the office and turn over to him the District with all its attendant accountabilities and responsibilities. (Parenthetically, Forester San Luis went on vacation leave last week, Jan. 21/64, to Manila, for personal reasons).

The following are the timber licenses issued within this district which are very active in their logging operations:

| *Timber Licensees* | *Allowable Cut* | *Area* |
|---|---|---|
| Araneta and Sons | 6,794.00 M/3 | 4,316.00 Has. |
| Araneta Timber Company | 9,960.00 " | 4,600.00 " |
| David Consunji (DACON) | 13,200.00 " | 7,950.00 " |
| New Pacific Timber Co. | 19,150.00 " | 20,000.00 " |
| Rizal Diesel Parts | 13,150.00 " | 6,500.00 " |
| John Spirig, Jr. | 10,000.00 " | 12,000.00 " |
| West Basilan Timber | 12,313.00 " | 8,779.00 " |
| Western Mindanao Lbr. Co. | 37,590.00 " | 17,360.00 " |
| Jose Pichel, Sr. | 2,750.00 " | 4,500.00 " |
| Port Banga Timber | 16,200.00 " | 7,622.00 " |
| Francisco Tansengco | 28,300.00 " | 12,000.00 " |
| Timber Export (TIMEX) | 16,800.00 " | 20,000.00 " |
| Watts Selective Phil. Tbr. | 105,000.00 " | 47,000.00 " |
| American Rubber Company | 39,000.00 " | 15,560.00 " |
| Hercules Lumber Co. | 47,000.00 " | 22,000.00 " |
| Manuel Miranda | 15,000.00 " | 5,500.00 " |
| Sta. Clara Lumber Co. | 92,280.00 " | 40,000.00 " |
| Elizalde Internat. (PI) | 16,250.00 " | 15,700.00 " |
| Zamboanga Sur Tbr. Co. | 24,600.00 " | 14,000.00 " |
| Martha Enterprises | 23,900.00 " | 20,000.00 " |
| Mindanao Lumber Co. | 72,000.00 " | 16,640.00 " |
| P. A. Rodriguez | 9,500.00 " | 7,200.00 " |
| B. B. Andrada | 12,000.00 " | 6,800.00 " |
| Asia Development Corp. | 20,000.00 " | 13,000.00 " |
| Andres Bernales | 2,115.00 " | 2,090.00 " |
| Cabaserca Lumber | 19,000.00 " | 8,000.00 " |
| Misamis Lumber Corp. | 30,800.00 " | 23,000.00 " |
| Francisco Olizon | 9,000.00 " | 5,900.00 " |
| Phil. Overland Tbr. Co. | 9,000.00 " | 4,800.00 " |
| Woodland Timber Co. | 9,000.00 " | 5,900.00 " |
| Total area licensed | | 506,627.00 hectares |

The above tabulated statement shows that there are 30 timber licenses issued within this district with an aggregate forested area of about 506,627.00 hectares.

These vast forest areas certainly need very badly the constant vigilance of not only forest officers and licensees but the public as well in order to ward-off the encroachment of illegal squatters and kaiñgineros. On the forest protection activities of this forest district, the following is hereby being presented:

| | | |
|---|---|---|
| Filed in court in previous year | 16 | cases |
| Filed in court during 1962-63 | 16 | " |
| Total cases filed | 32 | " |
| Tried and convicted this year | 8 | " |
| Total pending trial | 24 | " |

Of the 8 cases heard and decided in the lower court, 6 cases are on appeal to the Court of First Instance and one (1) case with the Court of Appeals.

The unending threat to our forest areas of illegal squatters and kaiñgineros is a big problem in all the districts but it has reached quite a dangerous stage in Forest District No. 43 (Zamboanga City) because it is highly suspected that they are politically well entrenched. Imagine a seeming'y "landless" and apparently "poor" kaiñginreos could influence the town council of Kabasa!an, Zamboanga del Sur, to have their squatted areas constituted and proclaimed by them as a legally organized barrio. Also influence the Division Superintendent of Public Schools to organize and assign a barrio teacher in these squatted areas. Because they can make their "influence" be felt by the Sta. Lumber Company, this company had to furnish all the needed building materials for their homes and barrio school (meaning the squatters'). On top of these, there is always an array of defense lawyers in all trials of kaiñgin cases, and surprisingly enough they can afford to appeal these cases to the Court of First Instance, then to the Court of Appeals.

Not only that, but above all, they can afford to have a lengthly legal battle which certainly is very costly on their part. It is highly suspected that not only are these well entrenched politically but they might have formed a "syndicate" since their vociferous leaders here within Zamboanga del Sur are also known as kaiñginero-leaders in Occidental Misamis del Norte. These are the group of men that bear watching. We are exactly doing that since all "patrol forces" in the field are duly alerted. But there is dismal angle to all these drive against illegal kaiñgineros. This happened in previous years within the province of Occidental Misamis and again last year within the province of Zamboanga del Sur. It turned out that the "prosecutors", meaning the forest officers, were later on the ones being prosecuted. The case against Forester Magdaleno Ellazar and his forest guards which was personally investigated by the undersigned. This is about the "trump up" case of "arson" administratively filed with Malacañang against them, which in their signed statements, including the declarations of their witnesses, stated that they saw Forester Ellazar burn their dwellings found within their kaiñgined areas. Rigid cross-examination by me proved that their witnesses lied and the evidence further proved that they did not see anyone burn their dwellings.

Within this district, the following are operators of sawmills:

| *Sawmill Permittee* | *Type of Sawmills* | *Location* |
|---|---|---|
| Southern Lumber Company | Circular | Zamboanga City |
| Benjamin Go. Ass. Enter., | Circular | " " |
| Baliwasan Sawmill | Circular | " " |
| Abarro and Sons | Circular (not operating) | Labuan |
| Timber Export (TIMEX) | Circular | Zamboanga City |
| New Pacific Timber Co. | Circular | Recodo |
| Bautista Bros. Lumber Co. | Band/Circular | Sangali |
| Western Mind. Lbr. Co. | Circular | Curuan |
| Watts Selective Phil. Tbr. Co. | Circular | Ipil, Zambo. del Sur |
| TIMEX | Band | Ipil, Zambo. del Sur |
| Sta. Clara Lumber Co. | Circular | Kabasalan " " |
| Elizalde Int'l. (P.I.) | Circular | Buug, Zambo. Sur |
| B. B. Andrada | Circular | Pagadian " " |
| Misamis Lumber Corp. | Circular | Pagadian " " |
| Timber Export (TIMES) | Plywood Plant | Baliwasan, Zambb. City |
| Timber Export (TIMES) | Plywood Plant | Recodo |
| Timber Export (TIMES) | Chip/fiber board | Baliwasan, Zambo. City |
| Associated Int. Co. Inc. | Plywood Plant | Lumbayao, Zambo. City |
| Cabaserca | Plywood Plant (under construction) | Ipil, Zambo. del Sur |
| Sta. Clara Lbr. Co. | Plywood Plant | Kabasalan, Zambo. del Sur |

It will be noted from the above tabulated statements that besides existing sawmill, either circular or band, or a combination of both, actually being operated by timber licensees, there are also 4 plywood plants (with one still under construction) and one (1) chipboard or fiber-board plant. Yet even with these processing plants found within the district, exportation of logs to foreign countries especially Japan is still brisk. It is hoped that time will come when all the logs coming down from our forest will be locally processed for hte good of the country.

5. *Forest District No. 44, Basilan City*:

This forest district is the smallest in land area as it is comprised only within the territorial jurisdiction of Basilan City, including the numerous small island around the big island of Basilan. This forest district had to be organized as it was made to initiate the bold program on "selective logging" along our sustained yield forest management. It is here where foresters were trained who were soon distributed all over the country to carry on the work on "sustained yield forest management thru selective cutting". In other words, Basilan District was made a model and a successful show-window. The "forest management activities" all over the country today can be traced back to Basilan District. The land area of this district is distributed as follows:

| | | | | |
|---|---|---|---|---|
| Timberland area | (Commercial forest | 32,267.30 Has. | | 23.17% |
| | (Non-commercial forest | 951.30 " | | .07% |
| | (Brushland | 407.70 " | | .03% |
| | (Open land (Kaiñgined) | 1,223.10 " | | . 9% |
| | (Swamp area (Mangrove) | 9,223.10 " | | 7.00% |
| | (Cultivated | 773.10 " | | .56% |
| | *Unclassfied forest*: | | | |
| | Cultivated land | 450.00 " | | .34% |
| | *Alienable & Disposable area*: | | | |
| | Brushland | 4,077.00 " | | 3.00% |
| | Open area | 6,056.50 " | | 5.03% |
| | Fresh marsh | 16,308.00 " | | 59.00% |
| | Grand Total | 135,900.00 " | | 100.00% |

The personnel and field offices administering the forestry affairs within this district are as follows:

a. *District Office, Isabela District, Basilan City*:
Fernando A. Roy ..... *District Forester*
Urbano M. Alcantara ..*Asst. District Forester*
Angel Mariano .... *Forester, TMA (Actg.)*
Quirico Tan .... *Forester, Lumber Inspector*
Bienvenido Gutierrez ..... *Forester, Coll. & Disb. Offi*
Felipe E. Manuel ..... *Station Warden & Check Scaler*
Demetrio C. Maramara ..... *Scaler*
Jose Pioquinto ..... *Forest Guard*
Luis Solamo ..... *Forest Gaurd*
Agustin Pascua, Jr. .. *EEA Lumber Inspector*

b. *Mahayahay, Maluso District*:
Lucio F. Cuevas . *Forest Guard, OCS (Actg.)*
Jose R. Alegarbes ... *Forest Guard—Scaler*
Abdul Maing ..... *Forest Gaurd*
Abdul Maing ..... " "
Hasan Usama ..... " "
Bonifacio Francisco ..... " "
Benvenuto Villarmino ... *EEA Forest Guard*
Danilo Capugñan ..... " " "

c. *Sta. Clara, Lamitan District*:
Faustino Perez . *Forest Guard, CCS (Actg.)*
Gapal Bairolla ..... *Forest Guard*
Antonio Enriquez ..... *Forest Guard*
Florante Agbulos ..... *EEA Forest Guard*
Benjamin Bayanbayan ..... *EEA Scaler*
Wilfredo Bustamante ..... " "

d. *Tumajubong, Lamitan District*:
Minardo Batoon . *Forest Guard, OCS (Actg.)*
Jovencio Agudo ..... *EEA Scaler*

There are only 4 lumber companies operating within this district, as follows:

Basilan Lumber Company
American Rubber Company
Sta. Clara Lumber Co., Inc.
Western Mindanao Lumber Co., Inc.

The above licensees are also operating within the Basilan National Park which is under the supervision and administration of Parks and Wildlife Office. The Sta. Clara Lumber Company will terminate their operation within the Bureau of Forestry jurisdiction about the end of June 30, 1964, and may ultimately leave Basilan City then if and when they cannot renew their ordinary timber license within the Parks and Wildlife Office this year.

Besides, timber licenses, there are also subsisting minor product licenses, viz: 19 licenses for "firewood" (mangrove species), 1 for "split rattan, and 2 for "unsplit rattan, making a total of 23 minor product licenses. Of this total, 12 are still pending renewal while 8 have already been renewed with 3 new licenses.

There are 34 pending cases, distributed as follows:

19 cases for land classification work (petition for the release of forest land for agricultural purposes)
7 cases of fishpond application
3 cases of Nipa-bacawan plantation applications
2 case sof woodland lease applications
1 case of Pasture application
2 cases of application for ordinary minor product license

There are 4 established sawmills within this district, as follows:

| | | |
|---|---|---|
| Agvid Construction Co., Inc. | Band Saw | Sta. Clara, Lamitan |
| American Rubber Company | Circular | Tumajubong, Lamitan |
| Basilan Rubber Company | Circular | Isabela, Basilan City |
| Western Mindanao Lbr. Co. | Circular | Kapatagan, Isabela |

All the above sawmill were all renewed for the fiscal year 1963-64. Besides these sawmills, there is one "veneer" plant being operated by the Basilan Lumber Corporation which exports dry veneer to the United States.

There are also established "lumber yards" which take care of the lumber needs of the fast growing communities within the different districts of this City, as follows:

Agvid Construction Co., Inc.—Sta. Clara, Lamitan
American Ruber Corp.—Tumajubon, Lamitan
Angtom Lumber Yard—Lamitan District
Basilan Lumber Corp.—Isabela District
Cristina Lumber Yard—Isabela District
Western Mind. Lbr. Co., Inc.—Kapatagan, Isabela
Visayan Lumber Yard—Lamitan District

Also, there are 3 box factories within Isabela District which utilize all the logging waste of the timber licensees.

The forest protection activities within this forest district is very active despite the fact that it is predominately a Mos'em City. This is so because of sustained cooperation of the two PC companies within this island City with the moral support of civic spirited citizens and with the material and financial help of all the timber licensees.

The following is the status of squatting and illegal kaiñgin within this forest district:

| | | |
|---|---|---|
| 92 cases | investigated & filed previous years ..... | 235.04 Has. |
| 146 cases | investigated & filed this year ..... | 272.37 " |
| 238 cases | TOTAL ..... | 507.42 " |

Of the total of 238 cases, 137 were tried with 38 cases dismissed and 99 convicted, making 101 cases pending hearing and decision by the court. The main reason for the dismissal of the 38 cases is because the government witness turned hostile during the hearing and also because the area involved was subsequently classified into "alienable and disposable" by the Land Classication Party. The reason for the big number of cases pending hearing is because when these cases are scheduled for hearing most invariably the defense counsel will ask for postponment which is usually granted by the court. We strongly suspect that this is a dilatory tactics being employed by the defense counsel inorder for him to have time to either coerce or bribe the government witnesses into declaring in his favor when the cases are finally heard. The District Forester is under standing instructions to always contact our witnesses, and if the suspicion is true that they are being coerced or bribed the matter must immediately be reported to the City Fiscal for his appropriate action.

Like the situation in Forest District No. 43 (Zamboanga City) this forest district is also very sensitive to Moslem arrogance and open defiance against constituted authorities clothed with power to enforce the Kaiñgin Law. There are times when our "patrol force" had to retreat because of the presence of armed bandits, suspected to have come from Jolo, within their patrol beat. The peace and order situation in Basilan City is far from improved because of the constant flight of Jolo bandits and other lawless elements from Jolo to Basilan City.

At present there are only 12 regular protection forest guards with 3 EAA forest guards. This number is reinforced by concession guards: 4 from the Basilan Lumber Corporation, 1 from Western Mindanao Lbr. Co. and 1 from Sta. Clara Lumber Company.

The whole forested areas within Basilan City is divided into several "patrol beats" and assigned to each regular forest guard. But because of the well-armed squatters and kaiñgineros plus the presence of "moslem" and/or "Yakan" lawless elements, the system of patrol is not by one man within his sector. To offset the superior arm force it had been the practice to organize the available forest protection forest guard into "patrol teams" of from 6 to 10 men and these teams go around fom one "sector beat" to police the area. Usually there are at lease 2 teams which are thus organized whose duty is only to see to it that any forest violations is properly checked, investigated, and the corresponding action taken immediately. The local PC companies has lent to the District Forester 4 MI Garand Rifles and 3 carbines for the protection of the "patrol teams". This arrangement has been arrived at in view of the fact that PC escorts are not available beause of the vigorous punitive action that they have launched against the lawless elements within this island city.

From the figures presented above, it seems that our campaign against illegal kaiñgin and squatting is quiet successful. It is not so, because most, if not all, of the convicted kaiñgineros most inva-

riably return to their kaiñgin. Sometimes, if the accused is a Moslem, more moslem relatives are being invited to come to Basilan from Jolo, thus their clearing is necessarily being increased.

6. *Forest District No. 48, Marawi City*:

This forest district, comparatively speaking, is the youngest among the other 5 districts within this Region. It was when the whole Lanao province was divided into "Norte" and "Sur" that this forest district was organized. It has district headquarters in Marawi City (formerly Dansalan town) and it is almost 100% Moslem territory.

The forestry activities within this district is administered and supervised by the District Forester thru its fieldmen and offices strategically located within the province of Lanao del Sur, as follows:

a. *District Office—Marawi City*

Francisco B. Barros . *District Forester (Actg.)*
Rosauro R. Santos ..... *Asst. District Forester (Actg.)*
Policarpio M. Narciso ..... *Forester, TMA (Actg.)*
Vitaliano M. Escalante .... *Forest Station Warden*
Benito Taculad ..... *Driver*
E'ena A. Gabac ..... *Emergency Clerk*
Adman Bulog ..... *EEA Clerical Aide*
Magunuga Datuiman .. " " "
Datuiman Lawi ..... " " "
Macapanton Batugan ..... *Forest Guard*
Ibra Dida-agum ..... " "
Dimatondary Macatanong .... " "
Ali Dangcag ..... " "
Gregorio Fabian ..... " "
Cando Pakute ..... " "
Cote Dirimbangan ..... " "
Shiek Potawan ..... " "
Itimbang Romero ..... " "
Pinto Abinal ..... " "
Ali Daruminbang ..... " "
Eliser dela Torre ..... *EEA Scaler*
Dohmo Lope ..... " "
Luis Suagan ..... " "
Digrar Mangcaan ..... " "
Tago Gampong ..... " "
Salik Alim ..... " "
Nicanor Maniwang ..... " "
Kbra Ampuan ..... " "

b. *Malabang Forest Station, Malabang, Lanao del Sur*:

Macalawan P. Dapit ... *Forest Guard, OCS (Acting)*
Eugenio Bailio, Sr. ..... *Forest Guard*
Vicente Pacquingan ..... " "
Antonio Subido ..... *EEA Scaler*
Vicente Tesnado ..... " "
Dionisio Fillalan ..... " "
Filemon Balante ..... " "
Mimbalawag Lawi ..... " "
Domiciano Cole ..... " "
Servando Yamaro ..... " "
Manuel Marcelo ..... " "
Desiderio Colina ..... " "
Romeo Baban ..... " "
Marcelino Robiñes ..... " "
Policarpio Cayabyab ..... *Lumber Inspecor*
Faustino Sunico ..... *Lumber Inspector*

c. *Forest Station, Wao, Lanao del Sur*:

Ermelo delos Santos ..... *Scaler, OCS (Acting) & TMO*
Basrodin Buleg .....*EEA Tree Marker*
Bating Marangit ..... *Forest Guard*
Gumersindo Salvado .... *EEA Forest Guard*
Jose Barnigal ..... " " "
Nestor Saligumba ..... " " "
Reyna'do Antonio ..... " " "
Batuan Alabao ..... " " "

d. *Marawi Timber Management Station, Marawi City*:

(Note: Under TMA)
Limgas Arimao ..... *Forest Guard*
Monare Abinal ..... " "
Misumar Pamli-an ..... " "
Radia Rambago ..... *EEA Forest Guard*
Macarthur Macagorong .. " " "
Talib Ali Magarang .... " " "

e. *Mapantao Timber Management Station*:

*Mapantao*:

Pangaga Pangcoga ... *Scaler, TMO (Actg.)*
Zaadudin Balut ..... *EEA Tree Marker*
Leoncio Barros ..... " " "
Severino Flores ..... " " "

*Land Classification Party* (Now working in Lanao del Sur):

Luis Paterno ... *Sr. Forester, Chief of Party*
Zoilo Lorenzo ..... *Forester, Member*
Jacinto Decena ..... *Forester, Member*

There are 19 timber licenses actively operating within the province of Lanao del Sur, as follows:

| *Licensee* | *License Number* | *Location* |
|---|---|---|
| Lanao Export Corporation | 1197—'63 | — Bubong, Lanao del Sur |
| Pacasum, H. A. R. | 472—'63 | — Kapai " |
| Maranao Tbr. Ind. Inc. | 819—'64 | — Lumba Obayabao " |
| David L. Ghent | 1340—'62 | — Saguiran " |
| Findlay Millar Tbr. Co. | LA—13-B | — Piagapo " |
| E. Dacudao | | — Kapai " |
| Vicmar Development Corp. | 10—'65 | — Kapai " |
| Tbr. Ind. of the Phil. | 13—'65 | — Kapai " |
| J. M. Javier Logging | 4—'67 | — Balabagan " |
| Pablo S. Luna | 660—'64 | — Malabang " |
| Pablo Cua | 935—'64 | — Malabang " |
| G. G. Tocao | 934—'64 | — Malabang " |
| A. L. Tocao | 985—'64 | — Malabang " |
| Guerra Ent. Company | 823—'64 | — Malabang " |
| Honorio Tumaob | 928—'64 | — Butig " |
| Lanao Development Corporation | 805—'63 | — Maganding " |
| Illana Bat Tbr. Corp. | 256—'63 | — Butig " |
| Datu Amalan Balindong | 147—'64 | — Malabang " |
| Casib Sangcopan | 1289—'6 | — Malabang " |

There are only 3 minor product licenses within the province, viz: 1 firewood (mangrove species), 1 firewood (upland species) and 1 for unsplit rattan.

Only one sawmill owned and operated by Mr. Pablo Luna in Malabang, Lanao del Sur. However, a plywood plant is under construction in Marawi City under the Maranao Timber Industry, incorporated. And there are 9 lumber dealers, all located in the poblacion of Marawi City, owned and operated by all Muslems.

This forest district being newly established and organized, it appears that they have not as yet made any investigation on cases of squatting and illegal kaiñgins. It seems apparent that the people being predominantly Muslems have a way of concealing their kaiñgins if there are any, or that the forest officers thereat are stymied to act adversely against the Moslems violators for fear of reprisals. The District Office does not have any illegal case so far recorded.

The above report for each individual forest district under Region No. 7, comprehensively brings forth the true picture of the forestry activities, problems, and forest situations within each forest districts. In this connection, it maybe mentioned without any undue desire on my part for agitating, that this vast region is presently being administered and supervised by the Regional Forestry Director alone. The personnel earmarked to man the Regional Office have not as yet been assigned and directed to report. Also, there are no equipment and supplies to ran an office of the Region, and there is no Clerical help available on account of the fact that all the "Clerical Aides" of Forest District No. 43 (Zamboanga City) where the Regional Office is located have been laid-off.

In view of the foregoing, the following recommendations are hereby being submitted for immediate and favorable action:

1. The personnel of the Regional Office should now be assigned and ordered to report to the Regional Director.
2. The functions and duties, per WAPCO justification, should likewise be promulgated for the single aim of decentralizaiton.
3. The much needed personnel to man the different districts, especially for scalling, lumber inspection, check-scaling, sawmill and lumber yard check, land uses inspection of applications and permits, all activities are revenue making, should likewise be assigned.
4. Liberal allotments for field expenses should likewise be provided, including funds for the much needed supplies and equipment and rentals of office buildings, especially that for the Regional Office.
5. Forester-Lawyers or Legal Officers in the Legal Division should be assigned to the different forest districts, especially those with serious kaiñgin problem, to help prosecute these kaiñgin cases in court in line with our program for more conserted action against illegal kaiñgin and/or violations of the Forestry Laws and Regulations.

*Very truly yours,*

JOSE R. CLAVERIA
*Regional Director*

Republic of the Philippines

Department of Agriculture and
Natural Resources

BUREAU OF FORESTRY
Zamboanga City

Administration
Supervision

October 25, 1963

MEMORANDUM FOR:
Honorable Benito Montinola
Undersecretary for Natural Resources
DANR, Quezon City

This is in connection with your recent visit of Mindanao from October 15-20, 1963 and of your request to put in writing the points observed and discussed along forestry matters.

While in Zamboanga City you had occasion to discuss the activities and problems of the different Bureaus and offices under the Department in your meeting with the DANREA and showed particular interest on forestry matters, especially on the following:

1. Selective Logging
2. Forest Protection
3. Logs/lumber export; Inspection work
4. Forest charges collection
5. Administration of field offices
6. Field supervision

To be able to see how successfully "selective logging" is being implemented I took you over to Basilan City which you readily accepted because you said "it is very good so I can also see the activities of the Parks and Wildlife and the Reforestation thereat".

So we showed you and discussed with you the mechanies of "Selective Logging" where "healthy residuals" (per our critirium) from 30% of the 70 cm. diameter class, 40% of the 60 cm. diameter class, and all of the 50 cm. thru 20 cm. diameter classes are marked, the percent of actual tree-marking is predetermined after a 100% "sample check" is made of which 60% is marked and 40% as allowance for unavoidable logging damages. Our reason for marking 40% of the 60 cm. and 30% of the 70 cm. diameter classes is to insure a continuous operation when the cutting cycle is reached since such big size trees are expected to have grown commercial sizes thus marking the second cut profitable.

You put a question to us by saying "how seriously are your men in marking the residuals and how about the licensees concerned, are they 100% with this very good program of the government?" I answered you in the affirmative, for indeed we are very serious in marking residuals as we not only have government tree-markers but also equal number from the company to constitute our "tree-marking crew and residual inventory crew" for that particular company. On the part of the licensees, there are those who are in dead-earnest, especially the big ones who only have a reputation to uphold but are 100% sold out to the idea of continuous harvest because of their huge investments, and as such, we have no problem. But some licensees, especially a few small ones, who employ the so-called "Bataan Logging system" (Logging Contractors who came into existence by virtue of RA 1239) present big probems for us. As a matter of fact I have already submitted reports naming names concerning logging contractors and licensees employing them and called the attention of higher officers that unless the Law (RA 1239) is amended to exclude logging contractors there will always be a stumbling block or an eye-sore in the overal program of "selective logging". I even mentioned the fact, and we discussed this lengthily, that in the whole logging operations, the contractor is superflous in the sense that the Bureau is very strict in checking everything about a new applicant before any license is issued. When a license is finally approved by the Department it is understood that the licensee is qualified, in every sense of the word, to hold and operate a timber license. So, I asked you, Mr. Secretary, taking all these into consideration, why is there yet a need of the licensee to employ *logging contractors?* I am afraid that by allowing logging contractors the government is unduly abetting "dummying" and/or "farming" of license.

From your remarks I know that you were impressed of what is "selective logging' 'in Basilan City since you actually saw how the two bureaus, Parks & Wildlife and Forestry, have implemented it. So, you asked the question "how successful will this work be if the threat of squatters and kaiñgineros cannot be removed?" In unison with the Asst. Dir. of Parks & Wildlife, we asked you to give more allotment and more forest guards because we know too well that it is only in saturating the forest areas with forest guards can we hope to minimize if not altogether stop the pernicious activities of squatters and kaiñgineros. You will note, Mr. Secretary, that while in Davao you were amazed to know that one forest guard alone had to patrol an area of 72,000 hectares. When normally it should not be more than 10,000 hectares, or less, to make his patrol activities effective!

You have been told also of the activities of squatter-kaiñginero syndicate; of how that and this local politician meddle with our fight against illegal kaiñgins both in the field and in our Courts; of how some cases are kept pending in court for a number of years; where young coconuts were just planted when the case was filed and now bearing, yet the case is still pending! We likewise have great difficulties in getting witnesses because we cannot pay for their subsistence and transportation for lack of adequate allotment.

After we have fully discussed the probems of *squatting and illegal kaiñgins*, you readily saw the solution which is nothing less than the employment of *more forest guards* to protect the selectively logged areas. And you made a suggestion that maybe we can get the money from the Reforestation Administration Office to finance such a wise move based on the fact that it is 100% better to protect what we can see and already have now rather than spending huge sums of money for artificial reforestation which trees planted we are not very sure of growing in the future. Certainly, Mr. Secretary, such statement does not mean that there is no immediate necessity for artificial reforestation. Indeed there is, Mr. Secretary, because we have no less than 5,000,000 hectares of open and denuded areas that need to be reforested, but we cannot escape the implication of the wise saying "it is better one bird in the hand than two birds in the bush". So the choice for priority of action for the much needed funds and personnel boils down to just one simple question. Should artificial reforestation be given more attention, funds, personnel, etc. and less to forest protection and unduly allow our forested areas disappear for the utter lack of these much needed personnel, funds and facilities? Mr. Secretary, I am not trying to pick up any trouble with the Reforestation Administration in my attempt to bring forth the bare facts. Whatever maybe your reaction, I still maintain that it is better to adequately protect what we have rather than plant trees which we are not sure to grow as we expect them to be!

You were disturbed on the activities of our Lumber Inspectors of unduly abetting *undergrading/misgrading* and overshipment of logs to Japan and other foreign countries. I told you that there are at least three government entities that check on log/lumber exports. The Bureau of Internal Revenue, Bureau of Customs and the Lumber Inspectors of the Bureau of Forestry. So, you can see, there is sufficient safe guard to avoid *overshipment*. As a matter of fact a very alert Customs officer noted some logs being loaded on a foreign boat without any forestry marks, so, he stopped the loading and investigated and found that the logs were properly inspected and graded but the Lumber Inspector was not able to mark all the logs. To allay your fear on overshipment, I would like to mention here that all Lumber Inspectors are under very strict orders not to leave the logpond and/or the boat before the loading is completed to forestall possible temptation of either *substitution* and loading more logs which are the possible sources of overshipment.

With the exception of Zamboanga City, the other forest districts reported to you that their forest charges collection as of the end of fiscal year 1962-63 was more than double their collections in the previous year. This attributed to the employment of the EEA forest guards and scalers, or what is to be expected when more personnel and facilities are made available. You have noted, while in Davao, the great bulk of "spilled logs" along nationa highways and logging roads which, according to the Asst. Dist. Forester of Davao are not as yet scaled for the utter lack of personnel and transportation facilities. You have been told also of the recurrent log smuggling going on which Mr. Dimasanta could not very well check because of lack of personnel and facilities to cope with the situation.

I also mentioned the fact that the condition obtaining in Davao is similar all over the country. You then told us that you will try to discuss all these problems with our Director Bernal for immediate solution, and you promised that results will come very soon.

On the administration of field offices you have noted that it is inadequate especially if such field administraiton lacks zeal and dedication to duty. You were very keen on asking questions from the chiefs of offices during our meetings and I noted you were peeved when no responsible officer could give you the answer. The case in point is that of the District Forester of Zamboanga City who was absent together with his Assistant District Forester. Forester George Batoon presently a TMA (Timber Management Asst.) came up to their rescue but could not answer your questions. There and then you verbally ordered me to look into the mattter and report my findings to you. You have expressed the view that in your pubic life, you are only guided by two coordinal principles: (1) Do unto others as you would others do unto you, and (2) Give to Casear what is Caesar and to God that is God. So, you exhorted everyone present that a good and successful administration must embrace those age-old principles.

You have likewise noted that the Bureau of Forestry is the only Bureau under the DANR without any Regional Director Offices in the field. And

you averred that the present administration wants decentralization of governmental functions in Manila. If field supervision is made from responsible field officers (not Manila officers) you were quite sure that efficiency of the service will be enhanced. So, may I remind you, Mr. Secretary, not that I have a personal interest being one of those slated as "Regional Director", but I am with your good reasoning on why there is need of decentralization and field supervision, to please see to it that the Special Order No. 20-1 of the Department is soon to be implemented in the field.

Summing up, Mr. Secretary, please work for the immediate realization of the following:

1. To insure the future success of our "Selective Logging Program there should be more (1) personnel (2) funds, and (3) facilities.
2. Please work it out in such a way that same Reforestation Administration Funds should be channelled to the Bureau of Forestry for purely protecting selectively logged areas.
3. Serious study should be made to amend RA 1239 so as to eliminate the activities of "Logging Contractors".
4. To beef up forest charges collection more forest guards/scalers and facilities.
5. Field supervision is necessary. Regional Offices should now be organized.

(Sgd.) JOSE R. CLAVERIA
*Forestry Supervisor II*

## ADMINISTRATOR VIADO ON REFORESTATION PROJECTS

Administrator Jose Viado of the Reforestation Administration said recently that the government has no reforestation projects in Davao and Agusan, two of the flood-stricken provinces in Mindanao.

The Administrator made the announcement in reply to inquiries about any reforestation programs for the ravaged areas designed to minimize the intensity of floods.

"We wish to state categorically that deforested lands in storm-hit Agusan and Davao are not within the administrative jurisdiciton and control of the Reforestation Administration. These areas are under the supervision of the Bureau of forestry," Administrator Viado explained.

He, however, stated that the Reforestation Administration can map out an effective reforestation program for these flood stricken provinces "but only after the areas are turned over to the reforestation agency." Otherwise, it will be difficult to undertake reforestation without definite understanding with the Bureau of Forestry, he warned.

Administrator Viado stressed that there are many parts of the public domain which need reforestation but it could not be done as the areas are within the jurisdiction of the Bureau of Forestry.

"As a matter of fact there are still areas needing reforestation that are not yet turned over by the Bureau," he said.

Asked about the success of forest reclamation work in the country, Administrator Viado said that in places where the reforestation administration has established plantations, man-made forests have shown their great capacities as flood detergents and as conservers of water for irrigation, hydro-electric power, and domestic uses.

In the Ilocos Region, for instance, the adverse effects of forest destruction are slowly but effectively being controlled following the creation of more forest reclamation schemes, according to the administrator. The agency has some 21 reforestation projects in Ilocandia, he added.

We want to establish as many or more projects in other regions like Mindanao and the Visayas. But first, we must have the necessary funds to carry our plans through, he concluded.

*RA Press Release*

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## FPRI TECHNICAL NOTES . . .

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sodium sulfite to sodium carbonate ratio is 5:1). The temperature was raised from room temperature to 120°C in 30 minutes, then maintained at 120°C for one hour to complete impregnation. From 120°C the temperature was raised to 170°C in 30 minutes and allowed to stay at 170°C from 0 to 30 minutes, depending upon the conditions desired. Yields, ranging from 87 to 92 percent, were obtainable.

Newsprint was produced from a mixture of 70 percent chip-chemigroundwood pulp and varying amounts of cold-soda pulp (semibleached) and bleached sulfate pulps. Buho (*Schizostachyum lumampao*) bleached sulfate pulp was used to give strength to the paper. Newsprint from 100 percent chip-chemigroundwood pulp was also prepared.

Results of these experiments were very encouraging, especially in the case of gubas chip-chemigroundwood pulp which was very light in color. The strength properties of the newsprint depended mostly on the amount of bleached sulfate pulp used. The strength properties, in general, approximated those of commercial newsprint although the opacity was slightly lower. Newsprint from 100 percent gubas chip-chemigroundwood had higher strength properties than commercial newsprint but the opacity was lower by about 6 points. By adding a small amount of commercial groundwood pulp, the opacity was improved to meet the requirements for commercial newsprint.

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## SPEECH DELIVERED . . .

(*Continued from page* 76)

or not the forest continues to benefit us, in one form or another, in our daily life. This is the reason why, we undertake a yearly observance of Arbor Week just so the people will become forest conscious and inject into them the awareness of responsibility to protect and conserve our forest resources. Forest protection is an essential requisitie to forest conservation. This is the big problem of the country today. It behooves every Juan dela Cruz, therefore, to make himself be seriously concerned with this problem and help solve it.

It is, therefore, my fervent hopes and ardent wish that during this Arbor Week, from July 23-29, 1961, on top of our multifarious activities and seemingly unending obligations both at home and in our respective professions and callings, we should pause and ponder a while to consider the fact that trees, either forest trees or ornamental and fruit trees, are our silent friends and uncomplaining benefactors. So that we should dedicate and spare even just a little time to plant trees, maybe in our farms, in our school grounds, plazas or in our offices and back yards. Above all, let us be forest conscious not only during arbor week, but throughout the year. All the members of the DANREA (Department of Agriculture and Natural Resources Employees Association) will render to you all the necessary assistance and material help that you may need. Let us, every citizen, the old and the young, rich and poor, the lowly and the highly placed officials, work hand in hand to make this year's Arbor Week observance a success.

I THANK YOU...

# Literary Attempts

# When the Mahogany Leaves Fall

HERMINIO B. SAMBAJON

Once more, Aling Berta opened the coverplates one by one to feel if the food she had prepared for Lino was still hot. There was the fried *bangos*, the sun-dried and roast *dilis*, the boiled eggplant, the *guinisang mongo*, and the sweet cooked rice, not to mention the patis and red tomatoes from her garden, all favorites of her son. Still hot, she covered them again carefully.

On one of the two bamboo benches placed opposite each other on both sides of the rectangular, old, wooden, red-mantled table, she sat facing the paneless and sill-less window. It was nearly twilight. The last rays of the sun penetrated the tiny holes on the nipa walls. Outside the window, she could see the leafless branches of mahogany silhouetted against the sunset sky. The fallen leaves were scattered all throughout the yard which she failed to sweep today. She loved to watch the tree. She associated it with Lino. She could not forget that whenever he went home he often told her: "When the mahogany leaves begin to fall, it's graduation time." And just five days ago she received a letter from Lino that he would come home with a title attached to his name: *Forester* Lino Cruz! Today was his graduation, and he would come before twilight from Los Baños, almost a two-hour trip to their place. Aling Berta had been busy the whole afternoon preparing her son's favorite dishes. She tried her best to have the best cook she had ever done in all her life. She wanted that this day be a special one. She sighed and smiled to herself. "At long last my son has his dream fulfilled." A happy mother she was. Gradually, her face expressed grief when she thought of her husband. "If only Jose is here," she murmured, "he would have the same feeling as I now have." And the past vividly came back to her.

It was a day during summer, in the afternoon, when she saw her unconscious husband carried by their neighbors. They said they found him lying unconscious in the farm with the plow and carabao. That night he became delirious and before dawn, in the presence of the doctor, he passed away. The doctor said it was a heart attack. How, she remembered, Lino cried. Lino, their only son and hope. He was her husband's inspiration to work harder in the little farm they had so that he could save a larger amount which Lino could spend in entering college. He had saved a little but that amount went all to his burial expenses. Her heart ached and she lamented when she reminisced she had not even had the chance to talk to him before he died.

After her husband's death, she leased the farm to a neighbor. Half of the harvest in the farm went to her as rent, the other half to the farmer. In order to live, she turned to sewing dresses of her neighbors. Her son, who was so eager to study, worked the hardest from selling newspaper to being a *cargador* in the town

market. They lived at the outskirt of the town, so he always got up very early. After a year and saving enough for his tuition, he went to college. A year after in college he stopped and worked again. It was by stopping to earn and then enroll again, then stop again to work and then enroll again and again that after nine years at last her son would graduate.

She knew very well the life Lino had in college. He lived austerely: rented a three-by-three meter room, cooked his food, washed and ironed his clothes, and hiked from the College of Forestry campus where he resided to a kilometer-distant College of Agriculture if he had certain subjects there. All the money he spent came from his savings. Except for the rice and a sum not more than five pesos she sent him monthly, she could not send more for the gain she got from sewing could hardly help make both ends meet. She too lived thriftily. Through all these would Lino come to finish his course.

SHE WAS startled. She heard somebody knocking at the door. It was the time she noticed it was already dark. "Lino is here!" she exclaimed with joy. She got up lightly and blindly and made stride toward the stove. She felt the only kerosene lamp they had and lighted it. With the right hand, she held it up in front of her and hastily crossed the small dim sala. The bamboo floor creaked as she stepped on it.

Lino there was none. Before her stood a policeman. She suspected something must be wrong and her heart beat faster. Yet she managed to smile and asked him what it was he wanted.

SHE found herself in a room in the town morgue. She could not believe that this was Lino, her only son. And yet she could not be mistaken. This was he. She felt she was going to be crazy. Lino, as she viewed him, was only sleeping. The doctor's sad voice broke the silence as he narrated. "The LTB bus where your son was riding collided with a passing train at a railroad crossing. According to those who witnessed the incident, the bus spinned thrice, then landed twenty meters away from the spot. Almost three-fourth of the passengers died. It was the tremendous hitting of your son's head by something hard that broke his skull." Then a long pause. "Here is the diploma which he still held tightly even after his death."

She did not know how she reached home. She just found herself very tired in ascending the bamboo stairs. The bamboo produced a creaking sound which to her meant more than her anguish. On the window, she found the lamp hanging still with light. She weakly took it and walked slowly to the kitchen. She put down the diploma on the table. From the flickering light of the lamp she held, she gazed at the covered food which she knew by now was cold. It was all her son's favorite. Outside the window, she could no longer see the leafless mahogany.

# *Significance of Moving-Up Day*

By Crisostomo B. Vilar

To honor the graduating forestry students, the U.P. College of Forestry holds annually a unique and symbolic celebration popularly known as Moving-Up Day. This day which is synonymous to the forestry students' graduation has been defined by none other than the Dean of the College Gregorio Zamuco as the 'moving up of the seniors (BSF and Rangers) from the status of dependence to the status of independence.

Indeed, to the graduating forestry students, Moving-Up Day is a red-letter day as the occasion culminates their formal training in the art and science of forestry. Moreover, the Day marks their leaving the por-

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LITERARY . . . .

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tals of the College to the bigger world of forestry where their mettle and common sense would be considerably tested in due course. Moving-Up Day, therefore, delineates the transition from the academic to the practical and challenging phase of the forestry career.

From the security of campus life, the majority of these graduating foresters will join the thousands upon thousands of the unemployed Filipinos. Either they would move up or down as the case may be depending upon the opportunity and their ability for success. On the other hand, to the graduating government pensionados, Moving-Up Day paves the way for their promotion to higher and more lucrative positions in the various agencies where they have been working.

There is no gainsaying the fact that Moving-Up Day emancipates the graduating forestry students from the brain-twisting quizzes, nerve racking recitations, and boresome term papers. Nevertheless, it is an incontrovertible fact that as soon as they are out in their respective fields of assignment, they will certainly be affronted by scurrilous politicians and be provoked by the stubborn kaingineros. Most important of all, their moral integrity will constantly be put on trial by the unscrupulous concessionaires and illegal sawmill operators who have the propensity for circumventing the forestry laws to enrich themselves overnight at the expense of the Filipino people. Then and only then will these foresters realize that they have moved up to confront the crucial problems of Philippine Forestry.

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**A winning essay for Freshmen:**

# *How it Feels to be a Freshman*

By NARCISO MINDAJAO

Freshman. That's the name a first-year student is dubbed: He finds himself engrossed in a self-inquiry as to its connotations only to come up with the flat notion that he is no more than an unsophisticated, simpering neophyte who bungles with tough academic work; a timorous, education-hungry derelict drifted into a strange island of neat-clad people who seem to be preoccupied with their differing schemes of attaining satisfactory grades at the close of the semester.

On the first day of classes, he meets his classmates who, though in close proximity, seem remote and unaware of each other's presence. He wants to talk to them but an invisible barrier prevents him from doing so. When he finally exchanges pleasantries with them, he is beside himself with joy and wonder to find out some are his provincemates. During the convocation, the Dean welcomes him to the college and wishes him success in his undertaking. He then promises to devote himself to his studies. The result of his first examination, however, brings home the stark fact that something is awry in his approach to effective study. A little despondent, he becomes. Yet, he believes a man worthy of his name does not easily succumb to initial setbacks. So he plods on more resolved than ever. The semester ends with his barely escaping the academic blind alley. He cannot help begrudging those who get excellent artings, but sympathizes with his less fortunate colleagues.

As the schoolyear wears on, he notices that his close friends are only those from localities near his own, and the upper-classmen identity themselves with the fraternity they belong to. He further observes that the non-fraternity members are virtual strangers in a bustling world. He dislikes to be a stranger. Shall he join the jolly group but in the process risk his study, or shall he stay an erudite recluse? He is in a dilemma.

## A Guest Editorial:

# NO SHAKING THE TREE

These days "as of this writing" has seemed about the safest way to chronicle the fast moving events in contemporary Philippines, especially as regards the frequent changes of officials in the government hierarchy. We do symphatize with the poor students in current events classes who must somehow try to keep abreast as to who now is roosting on this or that position or what post or posts are being occupied by this or that official.

In the case of the Bureau of Forestry, in a period of hardly over two years, it has the dubious distinction of having six—repeat, six—directors one after another. These include one who was director for only a few hours and who was reportedly yanked out hardly had he started dusting off the chair of his predecessor. Even the closest observers of Philippine forestry would have time putting the Serevo-Pecson-Piczon-Bernal-Zaldivar-Rivera sequence in its proper order.

Some of the directors were changed under somewhat confusing circumstances. Perhaps it is to the credit of President Macapagal that he changes his appointees as fast as he lost confidence in them. Management-wise, however, the appointing authority should have made a more rigid screening of each prospective appointee before letting him loose at so an exacting and sensitive position.

For these frequent changes are beginning to tell on the rank and file of the personnel and on the workings of the Bureau of Forestry. Among others, the smooth continuity of procedures so essential to an administrative set-up of the magnitude of the bureau has been shattered.

Then, too, the private sector which has dealings with the Bureau of Forestry has somehow to keep in step with every change introduced by each new director. Each incoming director cannot seem to resist contributing his two cents in introducing "improvement." It had happened that a policy or regulation one director threw overboard would be picked up by the next, then again discarded by the next, and so on *ad nauseam*.

Be it said to the credit of the foresters of the Philippines that while they have always wished for a technical man to head the bureau, they have nevertheless adopted the policy of cooperating with whoever heads this office. They refuse to shake the tree. They give to whoever is director their unstinted support. Perhaps they are sure that in such a very demanding position, they know that given enough rope the unprepared appointees would hang themselves without any assistance.

As of this writing, the acting head of the bureau is Director Apolonio F. Rivera. We have it on good authority that President Macapagal this time has taken special pains to getting a really good man. And it is about time, too. The President has had two strikes called on him. And in baseball a third strike could cost the inning, perhaps the game.

That's why Director Rivera must succeed. He should prove to the President and to the watching forestry circles that not only can a non-forestry man run the bureau but that he can run it better than a forestry man could. And this a big order!

N. P. LANSIGAN
*President, Society of Filipino Foresters*

March 1, 1964

# FORESTRY LEAVES

*Organ of the Student Body and Alumni of the College of Forestry, U.P.*

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## *Editorials:*

# Today's Food for Thought

The school year ends with traditional Moving Up Day. To-day marks the twenty-third Celebration of this College tradition auspiciously begun by Class 37. Today also marks the greatest number of BSF graduates in the history of our College. Today calls for a moment of reflection and retrospection. Reflection on the significance of the Day, and retrospection on what has been accomplished by the College since its foundation.

Moving Day which, in the words of Dean Zamuco, symbolizes the moving up of the Seniors (BSF and Rangers) from the status of dependence to the status of independence," gives every faculty member, including the Dean and the Visiting Professors, and the students, an opportunity to ask themselves whether or not the College has advanced, whether or not it has moved up, over last year's progress.

It cannot be denied that these recent years have been marked with much progress by way of additional buildings, faculty housings, laboratory equipment and facilities, upgrading of the faculty and increase in student enrollment. But we have also observed in other institutions that as they grew and expanded, intrigues and intramural jealousies and conflicts have also crept in. Could this possibly happen, too, in our College? Recent events outside of our College walls have shown us that there has been an apparent war of words among the different forestry agencies leading some times to misunderstanding. Worst of all comes the sad fact striking us in the eye that one does not need to go to the College of Forestry, to be trained in the art and science of forestry, in order to be at the head of what was once considered the most efficient government bureau, the Bureau of Forestry.

Naturally the question that comes up to our mind to-day is: Have we *really* moved up?

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## GLAD YOU ASKED

Bill: "Daddy, why is the earth round?"

Father: "I'm not really sure."

Billy: "What makes an elephant so big?"

Father: "I don't know, son."

Billy: "Am I bothering you with my questions?"

Father: "Not at all. You never learn anything if you don't ask."

* * *

## DECISION

Judge: "The jury has acquitted you of bigamy. Now you may go home."

Defendant: "Thanks, Judge. With which one?"

* * *

## NO, CORN!

"What does your son do for a living?" the city slicker asked the farmer.

"He's a bootblack in the city," was the reply.

"Oh, I see. You make hay while the son shines."

* * *

## GET IN LINE

"I have come here to make an honest living," the stranger in town said.

"Well, you won't have much competition," the native said.

* * *

## UNDER SUSPECT

Do you have a criminal lawyer in town?" a tourist asked an oldtimer.

"Well, we think so," the old man said, "but we can't prove it."

* * *

Harvard Professor: "Will you gentlemen in the rear of the class kindly stop passing notes!"

Student: "We're not passing notes. We're playing bridge."

Prof: "Oh, I beg your pardon."

* * *

A man picked up the phone and dialed information:

He: "What is the number of Mr. Joe Dill?"

Operator: "Is it spelled with a 'B' as in Bill?"

He: "No—with a 'D' as in pickle."

* * *

## PRACTICE MAKES PERFECT

Professor: "We haven't won any games this year, Coach, but at least the boys on the team are good losers."

Coach: "Good! They're perfect."

* * *

## BY THE SKIN OF HIS TEETH

As the two surgeons were leaving the operating room, one turned to the other and said, "That was a close one. An inch either way and I would have been out of my specialty."

* * *

## CHANGED HIS MIND

An elderly farmer, walking along a country road, was offered a ride by a stranger in a new, air-conditioned automobile. It was the old farmer's first encounter with air-conditioning.

"Where are you going?" the driver inquired.

"Down the road about 3 miles to work in my tobacco field," replied the farmer.

They had travelled only half a mile when he asked to get out of the car.

"But why?" asked the puzzled stranger. "I thought you were going to work on your tobacco crop."

"I was, but it's turned so much cooler, I think I'll go back home and kill my hog," the farmer said.

* * *

## FEET OR FEAT?

The clubwomen were peppering the explorer with questions following a dramatic lecture on his adventures in Malaya.

"Is it true," asked one, "that wild beasts in the jungle won't harm you if you carry a torch?"

"That depends," replied the explorer," on how fast you carry it."

* * *

## TAMIE'S BEEN SAYING SO FOR QUARTER CENTURY

On Sept. 6 last, the Daily Mirror Column "25 Years Ago" ran a digest of important news that appeared in the news columns of Sept. 6, 1938.

One of the items referred to a word of warning given by then Forestry Director Forencio Tamesis. Said the review:

Forestry Director Florencio Tamesis interrupts joy of log exporters of the country by pointing out that the record exportation of Phlippine trees to Japan is also depriving Filipino laborers of employment in the sawmills.

He adds that other problems afflict the local log industry and chief amogn them are high inter-island freight rates, low-grade lumber and timber, great waste in lumber manufacture and virtual ignoring of the need for forest conservation.

All of which proves that Director Tamesis was some sort of a crystal gazer. For what he said then has come to pass and today's economic policy makers can still learn much from what Tamie said then.

## FROM THE MAIL . . . .

(*Continued from page* 120)

P. O. Box 154
Manila, March 10, 1964

Forestry Leaves
College of Forestry
U. P., Los Baños, Laguna

*Gentlemen*:

This is to acknowledge with deep thanks your cooperation with the FIRST CONFERENCE WORKSHOP FOR LIBRARIANS OF MINDANAO AND SULU, and in particular, with my part in it concerning Philippine Periodical Literature.

Materials received were displayed on bulletin boards for all delegates to examine. Subscription forms were left for free distribution with a note, "Please take only one", in order to achieve widest possible distribution. All copies not posted were distributed free to delegates, with an urging to corresponding action.

As usual there was a general lament about lack of library support and of funds. However, there can be no doubt about the personal enthusiasm of delegates, and I trust you will see results in enquiries and subscriptions. In any case, your publications displayed now throughout the broad sweep of Mindanao and Sulu will give added prestige to your venture, and further advertising.

With cordial good wishes and hopes for fruitful collaboration in the future, I remain.

*Gratefully yours,*

REV. ROBERT J. SUCHAN, S.J.
*Director of Libraries*

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## FORESTRY IN THE NEWS . . .

(*Continued from page* 135)

### VIADO BARES 1964 REFORESTATION PROGRAM

The reforestation program for 1964 will have for its salient feature the establishment of reforestation projects capable of providing financial returns to the government, it was bared by Administrator Jose Viado of the Reforestation Administration.

The program also underscores cooperative forest reclamation work culminating in the production of community and village forests out of which the local inhabitants will draw their timber needs and other raw materials for local industries and other allied enterprises. Such a cooperative planting effort will furthermore create job opportunities for the unemployed and will eventually hike food production because of the enriched farmlands, plentiful water, and controlled erosion, according to him.

In the filed of research, the administrator has directed the technical services division to give extreme emphasis on studies and experiments designed to hasten the reforestation of denuded mountains and to explore possibilities of nitroducing and propagating new and improved forest tree species.

In outlining the Reforestation Administration's program for the New Year, Administrator Viado said that the groundwork for the setting up of the so-called production projects has already been laid with Mindanao as the initial target area. Mindanao which counts with two regional sites of the Reforestation Administration will have its barren areas planted to rubber, cinchona, lumbang, benguet pines, and other raw-material producing trees. The timber as well as the forest products will then be sold for that padly income for reforestation, he explained.

As regards cooperative reforestation activities, Administrator Viado assured that communities and villages desiring to plant quick cash forest crops for firewood, Christmas trees, and woodworking purposes, will be given technical assistance by his agency. Reforestation specialists will show them how to establish woodlots successfully, he said.

The administrator sounded the call for the joint venture specially to the Ilocos Region and the Visayas where deforestation has critically undermined the livelihood of the inhabitants. Aside from helping the government restore these bare lands to their former potential, they will also be helping themselves economically and financially, he concluded.

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# Incidentally . . . . .

*In Memoriam—*

It is with a deep sense of loss and sorrow that we felt (and still feel) the passing away of Dr. Manza on March 17, 1964.

To us and to all his former students he will always be remembered as a truly *wonderful* person, in every sense of the word.

* * *

## NOTE OF THANKS

*We are indeed very grateful to our advertisers and subsribers for making possible the continuous publication of the Forestry Leaves all these years.*

* * *

We wish to thank ever so much also For. Reg. Directors Jose Claveria and Ceferino Abella and District Foresters Barros, Dologuin, Jucaban, Labasay, San Luis, Soriano, Tremor and Viste.

* * *

*Thanks are also due for all those who, in one way or another, have helped us in making possible the printing of this year's Moving-Up Day Issue.*

* * *

## *FORESTRY LEAVES* GOES ON

At the beginning of the second semester, Dean Zamuco called us to his office and called our attention to a news item in the *Makiling Newsletter* of the Department of Forest Information edited by Professor Lim, that the FSBO unanimously approved a resolution to withdraw its financial support of the *Leaves*, and asked us what we were going to do about it.

We assured him that as long as we had his backing, & the cooperation of the alumni, especially the District Foresters, with or without the FSBO support, the *Forestry Leaves* would go on.

True to our word, we put out the *Arbor Week Forestry Day Issue* without asking a centavo from the FSBO.

* * *

*It turned out later that there had been no resolution of withdrawal of financial support, as shown by the FSBO minutes, and that it was only a group which wanted to put out another publication, and which needed, therefore, the FSBO support, and had moved heaven and earth to titillate the FSBO into approving a motion to withdraw its support of the Leaves and to give its full support to the Forestry Notes.*

* * *

## A MISCONCEPTION

Later, however, the FSBO Council changed its mind and decided to continue supporting the *Leaves*.

College Publications Committee Chairman, Professor Lim, and editor of the *Makiling Newsletter*, admitted that the printing of the news of FSBO withdrawal was due to a wrong impression given him by his news editor and the FSBO petition for putting out the *Forestry News*, through its Adviser and President.

* * *

*We greet the Forestry News "Mabuhay" and "Best Wishes!"*

* * *

## PRESIDENT ROMULO'S LETTER

We don't believe in blowing our horn, but we wish to quote a portion of a very encouraging letter from U.P. President Romulo to us:

"Every magazine with a special audience finds it difficult to maintain itself; but the fact that *Forestry Leaves* has continued publication indicates that it has been serving its mission and has thereby won many friends. This is only well deserved. As a college publication which has through the years consistently promoted the interest of students in the College and has indeed contributed to the thought and ideas of forestry services, *Forestry Leaves* is unique in its field.

"We need to be reminded in print, if not in person, of the value of our forests, and this the magazine has done. We need to be told that natural calamities like drought and floods, which wreak havoc on our cities and towns, year after year, are by no means unrelated to how well we, as Filipinos, guard our watersheds from destruction through thoughtless despoliation. With the same insistence, we have to be reminded that from our forest resources may be derived, with the aid of science and technology, some special contributions to our attainment of prosperity and the good life.

"In every phase of human activity there is always need for moral guidance. A magazine because it can subtly but ably speak to its audience, can set the moral tone and explain to its readers the values that make man's activity meaningful . . ."

* * *

*We also wish to call the attention of our readers to pages* 119 & 120 *of this issue's Mailbag section.*

* * *

We must confess that without the help of the Alumni, especially the District Foresters and our friend advertisers, the *Forestry Leaves* would have wilted and shriveled up a long time ago.

* * *

Department of Public Works and Communications
BUREAU OF POSTS
Manila

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The undersigned, JOSE B. BLANDO, Adviser of FORESTRY LEAVES, published quarterly, in English, at College, Laguna, after having been duly sworn in accordance with law, hereby submits the following statement of ownership, management, circulation, etc., which is required by Act 2580, as amended by Commonwealth Act No. 201.

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| *Owner*: U. P. COLLEGE OF FORESTRY | College, Laguna |
| *Publisher*: STUDENT BODY & ALUMNI, College of Forestry | College, Laguna |
| *Printer*: JMC PRESS, INC. | 52 Quezon Blvd. Ext., Q. C. |
| *Office of Publication*: | College, Laguna |

In case of publication other than daily, total number of copies printed and circulated of the last issue dated March 1963;

| | |
|---|---|
| 1. Sent to paid subscribers | 520 |
| 2. Sent to others than paid subscribers | 480 |
| Total | 1,000 |

(SGD.) JOSE B. BLANDO
*Adviser, Forestry Leaves*

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